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PUBLIC TELECOMMUNICATIONS

IN

PENNSYLVANIA

Pennsylvania Public Television Network Commission

COMMONWEALTH OF PENNSYLVANIA

PUBLIC TELECOMMUNICATIONS

IN

PENNSYLVANIA

May 1982

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We are also grateful to the National Telecommunications and Information Administration of the U.S. Department of Commerce for funding the study.

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TABLE OF CONTENTS

EXECUTIVE SUMMARY. vi

I. INTRODUCTION: BACKGROUND AND PERSPECTIVE. 1

A. Telecommunications Study Mandate
B. Objectives
C. Definitions and Scope
D. Advisory Groups and Consultants
E. Survey Forms and Interviews
F. Background and Resource Material

II. FINDINGS AND RESULTS 8

A. Overview
B. Systems Inventory and Coverage

1. Microwave and Non-Broadcast Systems
2. Origination Facilities
3. Broadcast Transmission

C. Survey Results

1. Survey Group Categories
2. Message Type Categories
3. Communication Flow Modes
4. Interaction Modes
5. Utilization of TV or Quality Audio
6. Dedicated Circuit Inventory
7. Meeting-Oriented Activities
8. Geographic Distribution

D. Discussion

III. CONCLUSIONS AND NEEDS. 49

A. Audio/Video Equipment: Commonwealth Non-Broadcast

1. Usage and Coordination
2. Procurement
3. Maintenance

B. Audio/Video Equipment: Nonprofit Sector

1. Relationships to Commonwealth
2. Procurement and Maintenance

C. Interconnection/Distribution

1. Computer System and Other Techniques
2. Microwave System
3. Public Radio System
4. Public Television Network System

D. Public Broadcasting Coverage

1. Public Radio Service
2. Public Television Service
3. Increased Utilization

E. Emerging Technologies

F. Implementation and Future Development

APPENDICES

A. Commission and Advisory Groups 59
B. PPTN Survey Instrument 68
C. Survey Respondents and Interviews. 73
D. Survey Results 85
E. PSSC Report and Analysis 103
F. Telecommunications Center Concept. 173
G. Teleconference Descriptions. 192
H. Mission Statement. 207

BIBLIOGRAPHY 210

GLOSSARY 212

MAPS

Map 1 PPTN Microwave System 10
Map 2 State Microwave Systems 12
Map 3 Hahnemann Medical Microwave System. 15
Map 4 Pennsylvania Educational Communications System. 17
Map 5 Public Television Station Coverage. 29
Map 6 Public Radio Station Coverage 31

EXECUTIVE SUMMARY

Virtually from the day it was established more than a decade ago, the Pennsylvania Public Television Network Commission (PPTNC) has played a leading role in evaluating the rapidly accelerating telecommunications revolution, which has generated such electronic wonders as satellites, video storage and retrieval devices, computer miniaturization, cable, data transmission, and teletext systems. Certain that this broad range of communications technology beyond broadcast television promised radical changes for message delivery in the coming Information Society, PPTNC adopted a series of revised mission statements in 1979 to address the impending challenges.

Chief among the statements were proposals to develop a coherent and effective system of telecommunications in Pennsylvania, working with the Administration and the legislature to conduct the necessary studies, analyses, and inquiries. Governor Dick Thornburgh subsequently named PPTNC as the lead agency for the comprehensive statewide telecommunications project; PPTN then applied for and received a federal grant under the Public Telecommunications Facilities Program of the National Telecommunications and Information Administration (NTIA) to conduct the study. It was to be focused on existing facilities throughout the Commonwealth, in the areas of public television and radio, cable, state and nonprofit microwave circuits, and state teleproduction installations.

There were six specific objectives of the study, but the comprehensive guiding purpose was to analyze and make recommendations in regard to coordination, operation, and management of telecommunications facilities toward the end of more efficient and cost-effective use throughout the government, independent, and nonprofit sectors.

Advisory Groups

Several advisory groups provided guidance and assistance to the PPTN staff carrying out this project: the Intra-Agency Advisory Committee, which was composed of representatives from key state offices and agencies; the Long-Range Planning and the Network Operations Committees of PPTNC; and the PPTN Commission itself.

Definitions

Telecommunications technology is generally defined as a means of transmitting electronic signals from one location to another, most often instantaneously. Generically, the electronic signals take three basic forms: video, audio, and data.

A specific application of this technology is called the teleconference, which allows interactions between people in different geographic locations. The teleconference was one of the major areas of investigation in the study.

Survey Forms, Interviews, and Background Material

The two basic considerations in the survey instrument designed by PPTN were: first, to present a simplified request for information; and second, to separate high-use from low-use organizations. Approximately 250 surveys were mailed to organizations in the nonprofit sector, with a 26

percent rate of return. Of the more than 500 surveys sent to governmental agencies, there was a combined return rate of 95 percent. Further, in-depth and intensive interviews also were conducted with key individuals in state and nonprofit organizations.

Background and corroborative data were gleaned from a variety of outside sources, particularly in broadcasting, cable, and computer facilities. Also, reports of comparable endeavors at state and regional levels elsewhere in the country were examined.

Findings and Results

The Findings and Results section of the study reports on the information supplied by inventories of distribution systems and origination facilities, geographic coverage patterns projected for broadcast transmission, and the returns from the survey instrument. The basic questionnaire sought to measure the volume of activity among groups of state and nonprofit entities as well as with the general public, both as providers and receivers of communications. Message categories examined included electronic data processing, records, statistics, action advice, and information. Interaction modes for message delivery included telephone, mail, personal contact, or some other means.

Specific uses of telecommunications facilities were assessed by questions relating to where message providers/receivers were located and whether distribution was broadcast or closed circuit. Information was also sought about the maintenance of dedicated circuits and the purpose of such facilities.

The concluding section of the survey requested information about current and anticipated involvement in large-group activities such as

conferences, seminars, interagency meetings, hearings, or other public meetings.

Extensive analysis of the survey results points to certain trends and conclusions, which are highlighted here.

Communication Types and Flow

Message exchange among only government agencies is concentrated primarily in the area of "Information," while the volume of message exchange among only community nonprofit organizations is about an equally high concentration among two types: "Information" and "Action Advice." Message flow between government and community organizations is about even, that is, they both "provide" and/or "receive" about the same amount of information from each other. In contrast, communication with the general public is almost totally a one-way flow from these organizations providing rather than receiving information. "Telephone" and "Mail" constitute the major means of interaction among all groups, followed by "Personal Contact." These results offer an opportunity and challenge for the application of telecommunications technology and associated techniques.

Among the message categories, there was very little employment of electronic data processing (EDP) for the distribution of materials. Such a result appears to be attributable to the lack of economical EDP communications circuitry as well as to incompatibility among the various makes and models of EDP equipment. It should be noted, however, that the principal method of exchanging information between government agencies soon may be EDP, following the installation of the recently authorized Commonwealth Computer Communications System.

Implementation of that system, in addition to allowing an interactive processing of data and the facilitation of information exchange, will permit cost and time savings by reducing the extensive intervention in the communication process shown by the survey results.

Further, it is apparent that additional cost savings could be realized by allowing direct interactive access to the Commonwealth EDP Network by organizations which exchange a substantial amount of information with state agencies, such as those in the nonprofit sector.

Use of Audio/Video Equipment

Response to the survey revealed a significant use of broadcast radio and television among government agencies and nonprofit organizations. Follow-up interviews determined that most of this activity was using radio for informational public service announcements, essentially because of economic considerations.

Although intense interest was expressed, compiled interview responses indicate that insignificant activity is taking place which utilizes audio/video equipment for training or general educational purposes. Follow-up interviews also indicated that, while the decision to forego the use of this equipment was apparently economic, this was often the case because those at the decision-making level were uncertain about the appropriateness and/or efficiency of this technology.

Meetings and Teleconferences

Estimates of meeting-oriented (as distinct from person-to-person) activities showed a preference for "Conferences" and "Seminars," followed by "Interagency Meetings," with "Hearings/Public Meetings" being the least

frequently mentioned form by a considerable margin. In terms of frequency of current involvement and projections for future meetings, the percentage of those mentioning "never" went down in the future projections, and the percentage of "frequent" went up in every instance except one where it remained the same. Of further significance is the projected change in the purpose of the meetings, with a decrease in meetings anticipated for agency communication and a greater emphasis on meetings involving non-agency persons. Follow-up telephone interviews revealed that respondents were anticipating budgetary limitations and the need to restrict such activities despite the perceived desirability of increasing them. These results strongly suggest the efficacy of utilizing teleconferencing techniques to help satisfy the projected need for meetings while reducing expenditures for travel and time lost away from the office.

PPTN, State Microwave, and Other Systems

The inventory of facilities revealed that the Pennsylvania Public Television Network (PPTN) operates a 1600-mile hub-and-spoke microwave system connecting the Network Operating Center (NOC) in Hershey with each of the eight Pennsylvania public television stations. The high-quality interconnection facilities provide two-way video/audio and are separately simultaneously programmable.

The NOC and each station is equipped with a 10-meter Receive-Only Satellite Terminal (ROT) with a minimum capacity of two separate program channels. These earth terminals are steerable but are normally positioned on Westar I, which then allows access to regional and national programs.

A comprehensive listing of all state-owned and/or -controlled microwave systems also has been compiled from the facilities inventory.

Two major cohesive installations have been identified: one operated by the Pennsylvania Turnpike Authority, and the second operated by the Pennsylvania State Police, both of which carry interoffice voice and data communications. At present, these systems have excess channel capacity and, when joined with other existing microwave segments, could provide relay sites for additional installations. Other facilities, such as at the Department of Education in Harrisburg, could be used as a relay site to provide statewide access directly from the capitol for the Governor and legislature. This is the type of information that is vital in comprehensive telecommunications planning.

Microwave systems in the nonprofit sector have been identified as being primarily associated with medical care institutions. Existing systems are almost all isolated in specific geographic locations and do not provide more than a localized service. For example, the Hahnemann Medical College operates a one-way microwave system extending from Philadelphia to the Scranton area. Instructional Television Fixed Service (ITFS) transmitters at these two points, operating about 4 1/2 hours per day, provide medical staff training and patient information programming to a number of hospitals in the eastern part of the state.

In addition to these diverse microwave distribution systems, there is also two-way radio. Such agencies as the State Police, Turnpike Authority, Department of Transportation, Fish Commission, and Game Commission operate extensive mobile radio communications systems. Examination of present traffic volume and capacity shows that these facilities are essentially limited to their present use for public safety and other communication services.

In spite of the extensive microwave and radio facilities, there was surprisingly little duplication since the capacities and technical specifications differ considerably.

Originating Facilities

Two significant high-quality production and recording facilities are operated by state agencies: one at the Department of Education; and the other at the Department of Transportation, managed by the photographic service. There is high potential among these and future facilities for unproductive duplication if equipment procurement and the range of services provided are not carefully coordinated.

CATV Systems

Few Commonwealth offices now have cable television service (CATV) from privately owned systems, but investigations show that most major government installations shortly will be capable of cable access upon completion of major interconnection systems presently under construction. The portion of the statewide CATV interconnection system already in place is carrying Pennarama, the umbrella title for the broad range of educational programming supplied by the Pennsylvania State University.

The investigation further indicates that, in general, there is not much use of cable television within the nonprofit sector either, again with the singular exceptions of medical care facilities and those organizations specifically directed toward community access. However, substantial construction of cable systems is under way. For example, the construction of high-capacity cable systems in both Erie and Pittsburgh, and the projection of a high-capacity cable system in Philadelphia, will soon provide

opportunity for the delivery of a wide range of governmental, public, and educational services, which means that such expanded cable capacity must be a major consideration in all subsequent telecommunications planning.

Broadcast Transmission

Analysis of computer projections and field tests of present broadcast patterns clearly show that the topography of the Commonwealth presents the major difficulty toward achieving full statewide television coverage. However, while geographic coverage is only about 90 percent of the Commonwealth, careful planning in originally locating the stations has provided some 99 percent of the population with public television service. All the public television stations are interconnected through the PPTN facilities.

The region not well served is comprised of the southern parts of Somerset, Bedford, and Fulton Counties, so most of the approximately 70,000 persons there have no access to social, public affairs, sports, educational, and cultural broadcasts from their own state.

Similar analysis shows that Pennsylvania public radio now serves approximately 88 percent of the population with FM broadcasts. Although allowed under Federal Communications Commission (FCC) policies, there are no public AM radio stations within the Commonwealth at the present time. It must be noted also that even though PPTN has the basic facilities in place to interconnect radio stations colocated at public television stations, statutory authorization does not exist to permit provision of this service.

Analysis of coverage projections shows that the greatest lack of public radio broadcast reception is in the central portion of the state.

This area includes the major urban areas of Altoona and Johnstown as well as a number of smaller communities and a large rural population with a total of more than one million citizens.

System Maps

Six maps were specially prepared, based on the detailed inventory, which show the PPTN system, the state microwave systems, the educational communications cable system, and the Hahnemann Medical College system, plus public television and public radio station coverage. Additional detail and analysis of the surveys and inventory are presented in the complete report along with a bibliography and eight appendices which provide even more extensive background material.

Telecommunications Needs

Needs statements which emphasize efficient utilization, coordination, and enhancement were developed in four specific categories of telecommunications facilities. The statements are based on the conclusions drawn from the inventory and the survey results which show that the use of telecommunications techniques and facilities will expand dramatically in the immediate future and also that broadcast coverage projections illustrate a great potential to provide increased access and services to all the citizenry. Fourteen needs were developed as follows:

AUDIO/VIDEO EQUIPMENT: COMMONWEALTH NON-BROADCAST

1. Usage and Coordination

There is a need for a coordinated, informed policy to assist state agencies in assessing the elements for and proper application of aural/visual techniques, to aggregate multiagency usage of

existing facilities, and to encourage the examination of operational functions for the purpose of evaluating aural/visual applications to ensure the greatest benefit to the users.

2. Procurement

There is a need for a logical, comprehensive governmental procurement policy, coupled with expert guidance at the technical level, to ensure that the equipment acquired is of suitable character, is compatible with other items of like equipment, and is obtained in sufficient quantity to satisfy the user demands, in addition to maintaining those procedures designed to assure proper function and best price.

3. Maintenance

There is a need for the establishment of a system to effect a preventive maintenance procedure for telecommunications equipment, as well as timely repair, and, assuming a commonality of equipment issuing from a comprehensive governmental procurement policy, the ability to exchange or loan equipment to further shorten the down-time cycle.

AUDIO/VIDEO EQUIPMENT: NONPROFIT SECTOR

4. Relationship to Commonwealth

There is a need for reexamination of state telecommunications service provision policies, especially to allow the formation of nongovernmental telecommunications cooperatives to aggregate user requirements, so as to better benefit from the efficiencies of telecommunications.

5. Procurement and Maintenance

There is a need for extended agreements under state procurement procedures, similar in nature to the process extending purchase agreements to local governments, which would allow nonprofit organizations the benefit of mass-purchasing of audio/video equipment; combined with a comparable maintenance procedure, there would be a resultant efficiency of resource utilization and an increase in the capacity to employ aural/visual techniques for the general welfare.

INTERCONNECTION/DISTRIBUTION

6. Computer System and Other Techniques

There is a need for the formulation of a policy which will foster a methodology to evaluate the applicability of data-base approaches to the comprehensive Commonwealth Computer Communications system and to encourage the timely implementation of a variety of such approaches, including utilization of cable systems.

7. Microwave System

There is a need for procedures which would establish microwave circuits on a Commonwealth basis rather than by state agency use; such procedures would allow interconnection between existing microwave circuits to form regional or statewide networks and also provide for coordination of circuits in conjunction with the Commonwealth Computer Communications Project.

8. Public Radio System

There is a need for statutory authorization which will enable the Pennsylvania Public Television Network to provide interconnection service to public radio stations colocated with public television stations.

9. Public Television Network System

There is a need to establish dedicated circuitry which would provide Commonwealth leaders with direct access to the Pennsylvania Public Television Network, the only facility which allows instantaneous television access to virtually all citizens in the Commonwealth.

PUBLIC BROADCASTING COVERAGE

10. Public Radio Service

There is a need to have public radio available in the central part of the state to provide the citizens there with both the traditional cultural and informational programming of public radio.

11. Public Television Service

There is a need for the citizens of southwest central Pennsylvania to have access comparable to the rest of the state to the arts, cultural, and routine or emergency governmental information programming provided by public television stations from within their own state.

12. Increased Utilization

There is a need to reexamine governmental operational practices and policies toward the goal of increased utilization of public broadcasting facilities for Commonwealth communications purposes, especially in non-broadcast production and distribution activities.

EMERGING TECHNOLOGIES

13. Monitoring Capability

There is a need for continual monitoring of communication techniques and technology developments to ensure that the instant capability exists to evaluate both the advantages and disadvantages of new developments so that consequent efficiencies and cost-effective use can be accurately determined.

IMPLEMENTATION

14. Interagency Body

There is a need for an ongoing interagency body to coordinate, advise, advocate, and assist in the development of Commonwealth telecommunications policy, planning, and activities.

Entreaty

This study has laid the foundation upon which a coalition of government, independent, and nonprofit private agencies can forge a coherent, cost-effective, and cooperative approach to telecommunications planning and utilization in the Commonwealth. The harnessing of communications technology to meet the educational, informational, health, and general welfare needs of the citizenry must be addressed vigorously, and

now, if full advantage of its vast potential is to be realized. There is no time left to stand idly by and contemplate; the challenge of the Information Society is no longer a future possibility--it is an undeniable and pervasive reality. Work should begin immediately to formulate an action plan to address identified and unsatisfied needs which can be met through coordinated telecommunications systems.

I. INTRODUCTION: BACKGROUND AND PERSPECTIVE

Late in 1979 the Pennsylvania Public Television Network Commission adopted a revised mission statement in response to the challenge presented by developments in communications technology which had taken place in the decade since its creation in 1968. The Commission recognized that the telecommunications revolution was well under way and was already having a profound impact upon the delivery of information well beyond the limited distribution capacities of open-circuit television broadcasts. Technological advances such as satellite transmission, video cassettes, video discs, miniaturization of computers, data transmission, teletext systems, and expanded cable and public radio capabilities promised changes of even greater magnitude in the impending Information Society of the 1980s.

The need to rethink and reorient the role of PPTNC, as well as that of each individual television licensee, was imperative. Among the mission statements adopted by PPTNC (see Appendix H) to address that recognized need, the following are especially pertinent to this study:

> PPTNC will work with the public television stations, public radio stations, and any other noncommercial telecommunications agencies to develop a coherent and effective system of telecommunications in Pennsylvania.
>
> PPTNC will work with all executive and legislative agencies and departments to facilitate the more effective use of telecommunications in the implementation of their missions.
>
> PPTNC will draw upon its operating history to provide human and technical resources and to act as a catalyst for such a planning effort, working with the Governor and the General Assembly to conduct the necessary studies, analyses and inquiries.

A. Telecommunications Study Mandate

These were not simply passive philosophical platitudes, but were intended to be a rallying call to action. Therefore, in the firm belief that through a coordinated approach the substantial state investment in telecommunications services and equipment--including such old reliables as telephones and teletypewriters--could be organized to bring about a savings of time, money, and energy resources, PPTNC initiated actions designed to help the Commonwealth of Pennsylvania to realize the benefits of expanded and enhanced utilization of telecommunications technologies.

Two actions are significant here. First, Governor Dick Thornburgh named PPTNC as the lead agency for the conduct of a comprehensive statewide telecommunications study, working principally with other state officials including the Governor's Office, the Department of General Services, the Department of Education, and the Office of Budget and Administration.

Second, an NTIA federal grant under the Public Telecommunications Facilities Program was applied for, and subsequently awarded in August 1980 for a projected yearlong planning study* focused on existing facilities throughout the Commonwealth, in the following five categories:

Public Television and Radio
Cable Television
State Controlled Communications Circuits
State Controlled Teleproduction Facilities
Nonprofit Communications Circuits

B. Objectives

Six objectives were specified in the planning study:

---

*Note: Unforeseen delays required extending the completion date to the end of May 1982.

Inventory all existing public telecommunications systems in the state which can be used to fulfill existing and future needs prior to the acquisition of additional facilities;

Identify those geographic areas of the Commonwealth not now receiving adequate public television and radio services, and recommend means of corrective action through the use of broadcast and non-broadcast technologies;

Identify duplicative distribution systems, and make recommendations toward the reduction or reconfiguration of such systems to reduce cost while maintaining and/or extending services;

Make recommendations regarding telecommunications systems and facilities which can be aggregated to serve currently unsatisfied needs or to reduce costs of operation;

Identify isolated facilities and activities which may, at modest or no cost, be interconnected to increase flexibilities, to provide interactive facilities, to improve information flow, or to integrate individual isolated activities into comprehensive statewide efforts; and make recommendations toward the most cost-effective means of such interconnection and possible funding sources for implementation; and

Identify common activities which, through a coordinated telecommunications network, may be organized on a statewide basis to allow improved service at greater efficiency and a reduction in administrative and operational costs, and provide models for the administration of those services through the use of telecommunications technologies.

Thus, the primary purpose of the study was to analyze and make recommendations in regard to coordination, operation, and management of telecommunications facilities toward the end of more efficient and cost-effective use. Any recommendations to consolidate and/or centralize facilities use must respect the unique mission of each entity so that the utilization of any such facilities to meet its own defined needs would not be impeded or restricted. The ultimate objective, then, was to provide a

coherent approach to telecommunications planning and facilities utilization. A parallel study conducted by the Special Committee on Electronic Data Processing, under an Executive Order of the Governor, focused on the specific needs and applications of telecommunications in that area.

C. Definitions and Scope

The generally accepted definition of telecommunications technology is that it provides a means of transmitting electronic signals from one location to another, usually instantaneously. The electronic signals take three basic forms, generically described as video, audio, and data. (These definitions and distinctions are treated at greater length in Appendix E, for those who wish additional detail. See also Appendix F, especially in regard to public TV stations who are weighing the various considerations involved in moving from "stations" to "telecommunications centers.") Suffice it to say here that differentiation among and awareness of the distinct technical characteristics of the three signal modes of video, audio, and data are crucial to the development and understanding of the results, needs, and recommendations presented later in this report.

Further, the utilization of telecommunications technology for the purpose of allowing interactions between people (or equipment programmed by people) in different geographic locations is now commonly referred to as a teleconference. (See Appendix G for examples of use.) One of the major areas of investigation in this study dealt with the teleconference and refinement of the techniques employed in such specific applications as video teleconferencing, audio teleconferencing, and data (computer) teleconferencing. Interest in investigating the vast potentials of this

technique was vigorously expressed during the study design phase by state agencies and nonprofit organizations as well as by entities whose roots are in public broadcasting. (A companion study on the marketing aspects of video teleconferencing and teletext is also under way by public television stations.)

D. Advisory Groups and Consultants

Several advisory groups provided guidance and assistance to the PPTN staff assigned to carry out this study: the Intra-Agency Advisory Committee, which had representatives from key state offices and agencies; the Long-Range Planning Committee of PPTNC; the PPTN Network Operations Committee; an ad hoc group of public radio station representatives; and the PPTN Commission itself. These groups met frequently throughout the course of the project. (See Appendix A.)

To assist in the organization of the work and to help ensure that no relevant entity or telecommunications user was overlooked in the survey questionnaire, ongoing relationships were established early in the study with many government, nonprofit, and community organizations, groups, and associations.

Consultations and interviews with individuals from these groups were extremely helpful not only in providing information about their own agencies and activities but also in the design of the survey instrument used to determine the extent of telecommunications facilities and uses.

The Public Service Satellite Consortium was hired as the prime consultant to work with the PPTN project staff, especially in analyzing and

applying information and data gathered through the survey returns, with particular emphasis on constructing models for service delivery systems. Two other consultants were retained on an individual basis to assist in the conduct of the study as well as in the formulation and construction of the final report.

E. Survey Forms and Interviews

The design of the survey instruments was twofold: first, to present a simplified request for information in order to encourage both a rapid and high rate of return; and second, to separate those organizations which warranted only peripheral inclusion in the study--by virtue of the nature or volume of their activity--from those which merited a high degree of involvement. (See Appendix B for a copy of the survey instrument.)

Further, in addition to the information generated in the surveys, in-depth and intensive interviews also were conducted with key individuals at selected state and nonprofit organizations. (A list of the agencies and organizations interviewed is included in Appendix C, along with a list of respondents to the survey instrument.)

F. Background and Resource Material

To assist in gaining perspective and a frame of reference on the specific results of this study, background and corroborative data on the extent, utilization, and service areas of telecommunications facilities were gleaned from a variety of outside sources. Particular mention must be made of the AreaPop projections provided by the Public Broadcasting Service in regard to broadcast television and radio coverage. The CABLE & Station

Coverage ATLAS was relied upon heavily for information about cable penetration in the Commonwealth and to supplement the November 1979 CABLE TELEVISION IN THE COMMONWEALTH OF PENNSYLVANIA: ANALYSIS AND RECOMMENDATIONS report. Valuable information about computer facilities and utilization was garnered from other Commonwealth studies compiled early in 1981.

For guidance in defining the scope of the study and in analyzing and interpreting the results, state and regional reports of similar endeavors were of great assistance. Of particular note are studies done in South Carolina, North Carolina, Iowa, and Virginia and by the North Central Telecommunications Consortium.

A bibliography and a glossary are included at the end of this report, along with the appendices.

II. FINDINGS AND RESULTS

A. Overview

This section of the report is based on the volume of material supplied by the inventories of distribution systems and origination facilities, plus the geographic coverage patterns projected for broadcast transmission (Section B), and the returns from the survey instrument (Section C). The major portion of the survey instrument represented a matrix of many factors which sought to measure the volume of activity among the survey groups of state and nonprofit entities as well as with the general public, both as providers and receivers of communications, in such specific one-to-one message-type categories as electronic data processing, records, statistics, action advice, and information. The interaction mode used in the communication exchange, such as telephone, mail, personal contact, or some other means, was sought and was vital in constructing a picture of present operations and activities.

Specific use of telecommunications facilities was addressed by questions relating to the location of message providers and receivers and whether distribution was over-the-air broadcast or closed circuit. Information about the maintenance by any of the survey groups of full- or part-time dedicated circuits and the purpose of such exclusive facilities was also solicited.

A final section sought information about present and projected involvement in large-group activities such as conferences, seminars, inter-agency meetings, hearings, or other public meetings.

A discussion of the results is presented in Section D. Expanded analytical treatment of the findings in a comprehensive telecommunications context, along with interpretative examples and models, is found in Appendix E.

B. Systems Inventory and Coverage

1. Microwave and Non-Broadcast Systems

PPTN System and Access

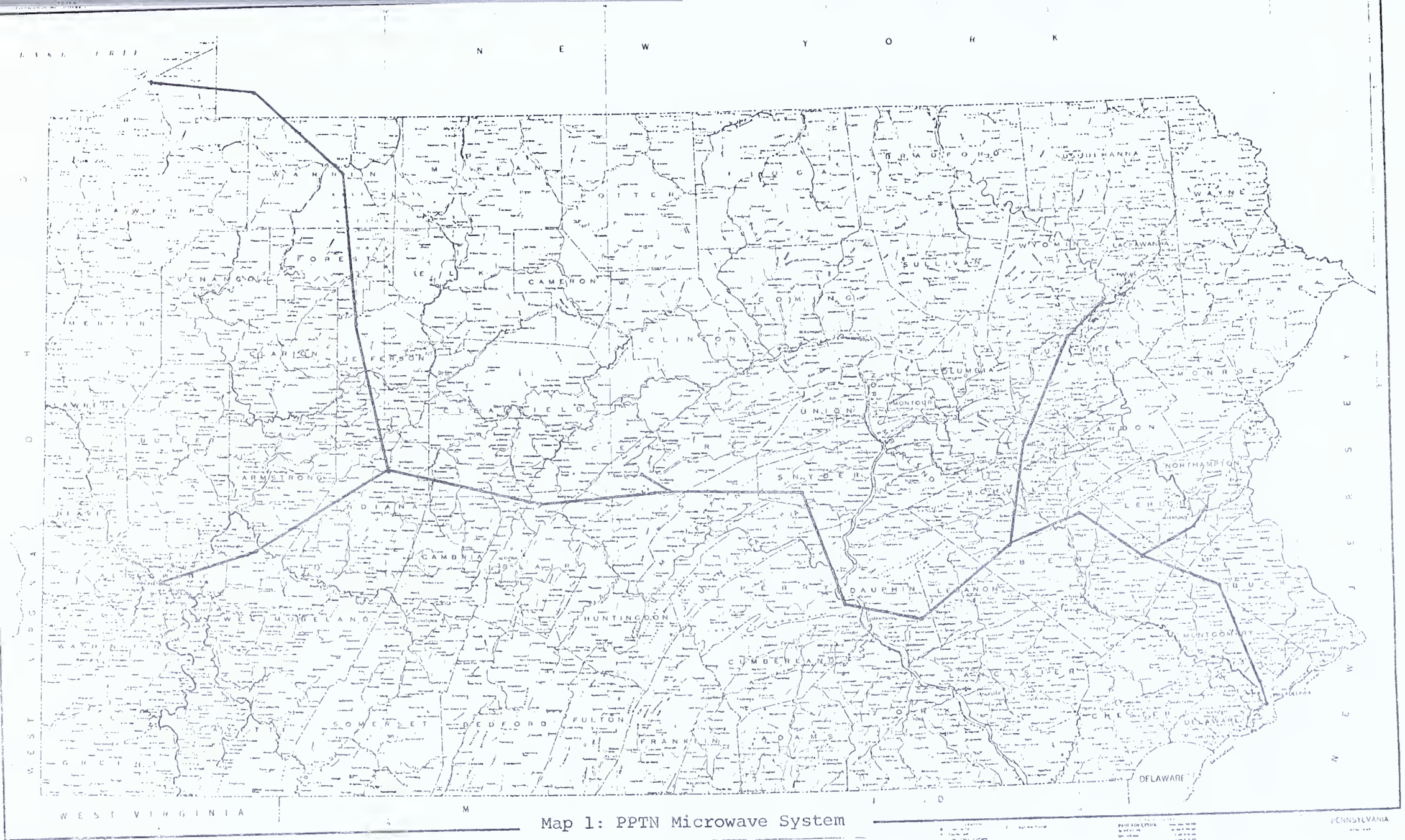
The Pennsylvania Public Television Network (PPTN) operates a hub-and-spoke microwave system (illustrated in Map 1) connecting the Network Operating Center (NOC) in Hershey with each of the eight Pennsylvania public television stations.* The primary carriers are two-way video/audio and are separately programmable.

The NOC and each station is equipped with a 10-meter Receive-Only Satellite Terminal (ROT) with a minimum capacity of two separate program channels. These terminals are steerable but are normally fixed on Westar I.

PPTN facilities, through various configurations, can extend available program sources and services. For example, by utilizing the interconnection system and the ROT operated by WPSX, PPTN can receive signals from Satcom I.

---

*WQED-TV/FM Pittsburgh (also operates WQEX-TV)
WQLN-TV/FM Erie
WPSX-TV University Park
WITF-TV/FM Hershey/Harrisburg
WVIA-TV/FM Scranton/Wilkes-Barre
WLVT-TV Allentown/Bethlehem/Easton
WHYY-TV/FM Philadelphia



Map 1: PPTN Microwave System

By utilizing the interconnection and other facilities at WPSX, PPTN can access Pennarama (see CATV section following for more information on Pennarama).

Through connection at WHYY, PPTN has simultaneous transmit and receive access to the Eastern Educational Television Network (EEN).

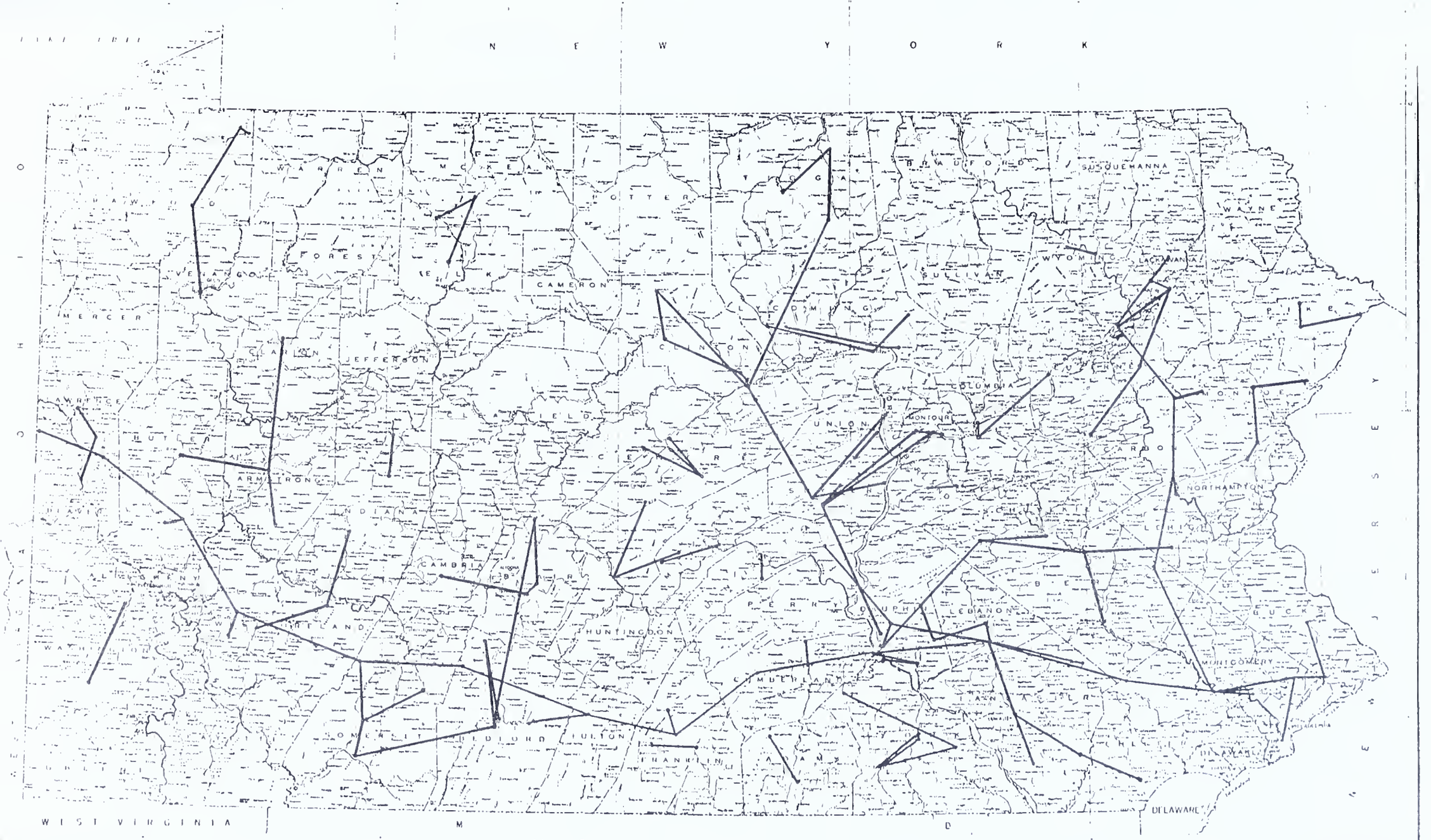
Through EEN, PPTN can secure transmit access to Westar I via the EEN uplink in Connecticut and also to the Main Origination Terminal (MOT) at PBS in Washington, D.C. Through EEN and the public television station in New York City, PPTN can obtain access to Western Union, RCA Americom, and the Comsat gateway.

As noted above, these facilities and capabilities are used to serve Pennsylvania public television stations but not radio, even though the technical capacity exists to interconnect all radio stations colocated* with public television operations. Lack of statutory authority prevents PPTN from providing such linkages.

State Microwave and Other Systems

A comprehensive listing of all state-owned and/or -controlled microwave systems has been compiled, and graphics have been developed to assist in the identification of common routings and possible interconnect points. Map 2 is a representation of the identified systems. There are two major cohesive microwave systems, among the many illustrated on the map, which deserve explanatory comment. The first, operated by the Pennsylvania

*See footnote on page 9.



Map 2: State Microwave Systems

Turnpike Authority, extends across the southern portion of the state from border to border; the second, operated by the Pennsylvania State Police, extends northward from the capital area past the mid-point of the state. Both systems carry interoffice voice and data communications as well as two-way radio communications as their major traffic. The fact that both systems currently have excess channel capacity and have, together with other existing microwave segments, the ability to provide relay sites as needs expand is highly significant in telecommunications planning.

The identification of major user-agencies of two-way radio communications indicates that traffic volume and capacity severely limit increased use of these communications facilities. Such agencies as the State Police, Turnpike Authority, Department of Transportation, Fish Commission, and Game Commission operate extensive mobile radio communications systems. These systems are highly utilized so that, even with their extensive coverage of the Commonwealth and the large number of mobile units in service, they cannot provide for more than the present task of satisfying public safety and communications needs.

Dedicated circuits not associated with Commonwealth-maintained Telpak or leased-wire services have been identified. It has been determined that these circuits are generally voice-grade, leased-wires used primarily for computer communications.

A comprehensive listing of Telpak, Wide Area Telephone Service (WATS), and leased services under Commonwealth centralized control has been developed.

Detailed information about these state-owned and/or -controlled distribution systems, not shown on Map 2, is on file.

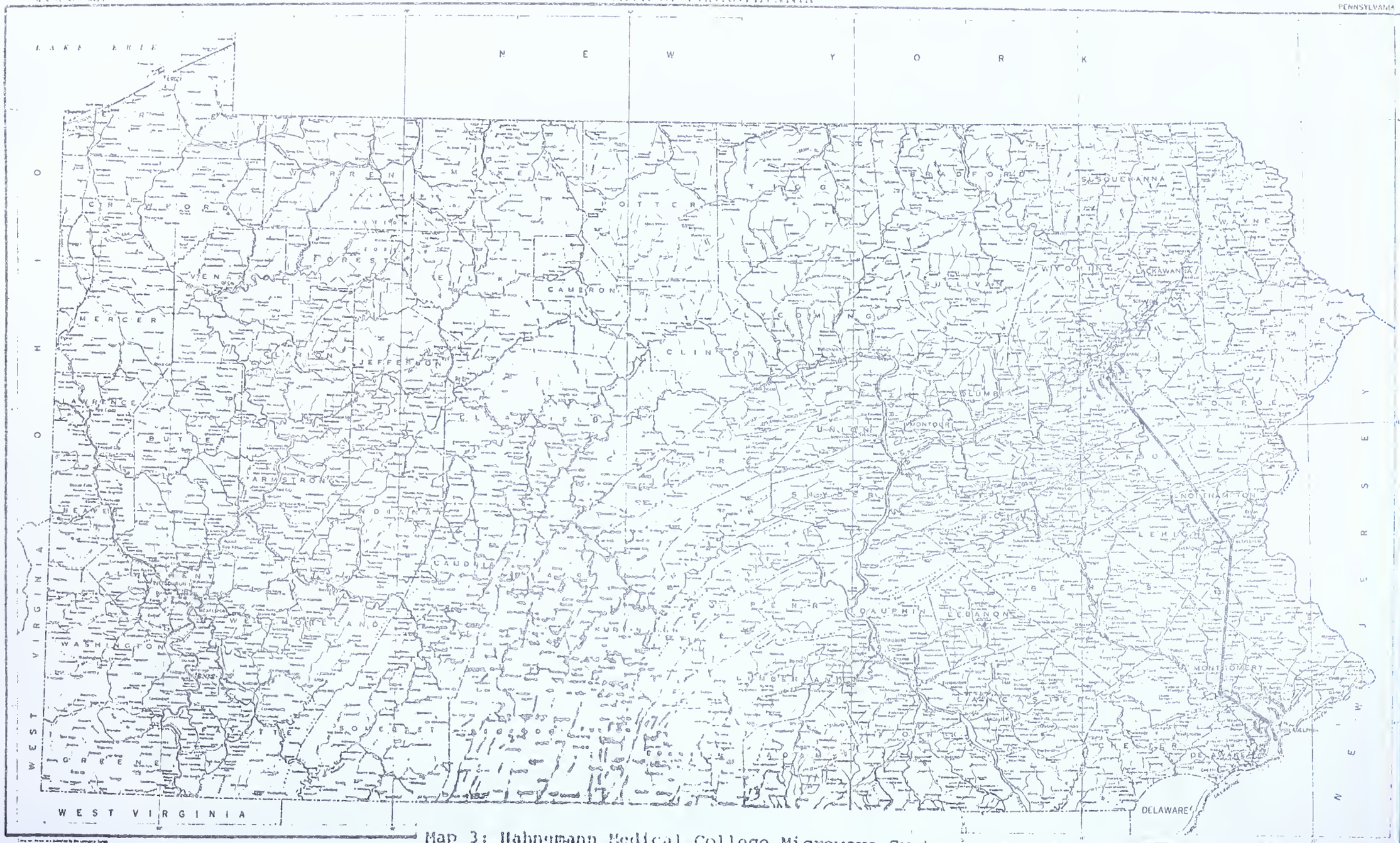
Microwave systems in the nonprofit sector have been identified as being primarily associated with medical care institutions. These systems are generally isolated in specific geographic locations and do not provide more than a localized service.

The Hahnemann Medical College operates a one-way microwave service extending from Philadelphia to the Scranton area. ITFS transmitters at these two points provide medical staff training and patient information programming to a number of hospitals in the eastern part of the state. The system presently carries approximately 3 programming hours per day of patient information and approximately 1 1/2 hours per day of training. Installation of a satellite receive terminal and expansion to a two-channel system in the near future are planned expansion projects.

Map 3 illustrates the systems used by Hahnemann Medical College.

CATV Systems

Identification of individual CATV systems was, necessarily, assembled from published industry data and from reports of predicted activity projected by the Pennsylvania Cable TV Association.



Map 3: Hahnemann Medical College Microwave System

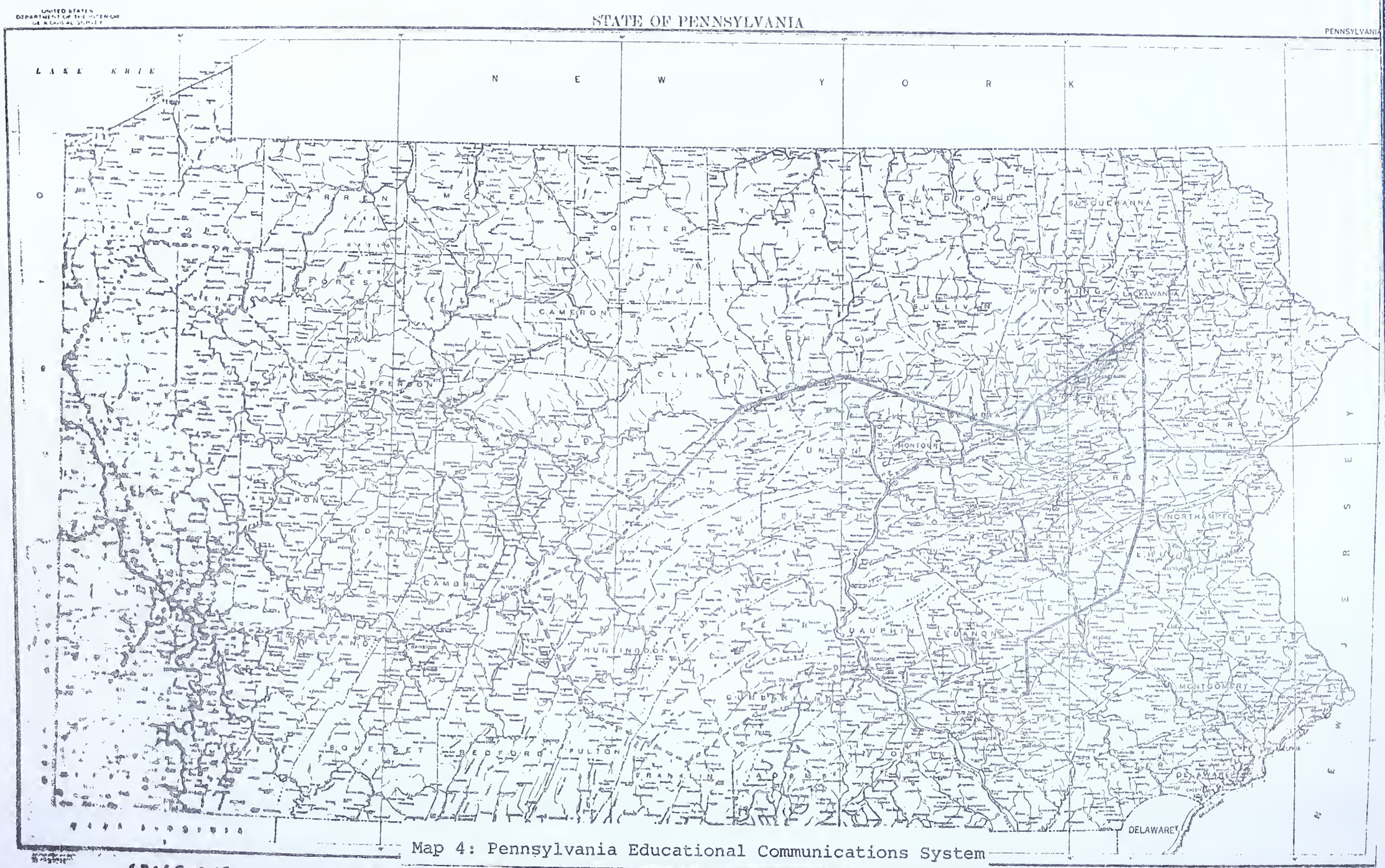
It has been found that few, if any, Commonwealth offices now have cable television service. However, most major government installations are now, or shortly will be, capable of cable access.

A major interconnection system presently in the construction stage, when complete, will provide statewide CATV interconnection. The system utilizes Cable TV Relay Service (CARS) and Multipoint Distribution Service (MDS) technologies and is capable of providing a variety of services in addition to audio and video. The portion of the system which is now in place is carrying educational programming supplied by the Pennsylvania State University, referred to as Pennarama.

Map 4 shows the status of this Pennsylvania Educational Communications System.

The investigation further indicates that, in general, there is little use of cable television within the nonprofit sector at the present time, with the singular exceptions of medical care facilities and those organizations specifically directed toward community access. There is an extensive use of both patient-directed and staff-directed health care television programming within the Commonwealth; since this is an individualized effort, use data is still in the development stage.

According to figures compiled by the Pennsylvania Cable Television Association, there are nearly 1300 communities in the Commonwealth which are served by cable television systems, with cable service being provided to approximately 30 percent of homes.



Map 4: Pennsylvania Educational Communications System

STAGE ONE COMPLETED

STAGE TWO UNDER CONSTRUCTION

STAGE THREE PROPOSED

While nearly two-thirds of existing cable systems in the state have a capacity of no more than 12 channels, it is important to note that a number of high-capacity systems are in existence and that several of the state's largest communities are not yet, or only beginning to be, served by cable systems. For example, the Commonwealth's largest city, Philadelphia, has not yet awarded cable franchises for the entire city; Pittsburgh and Erie awarded franchises only in the last year. These systems, when complete, will provide modern cable technology service to the large percentage of the state citizenry residing in these areas.

A large number of existing systems, although limited to a degree by system capacity, provide local access programming to serve the specialized needs of the local community. One of the most notable of these efforts is Berks Community TV, which uses the facilities of Berks Cable TV in Reading (for more detail, see Appendix E). The forthcoming systems in Pittsburgh and Erie have franchise provisions for the development of channels to serve the needs of community groups and local governments, and it is likely that any franchises awarded in Philadelphia will contain similar provisions.

The delivery of similar community, educational, and governmental services on a statewide basis is highly feasible. Such services could be realized through the combined utilization of the local distribution capabilities of the public broadcasting stations and the three primary public video carriers in the Commonwealth:

PPTN, Hahnemann Medical Network, and Pennarama, since they are all physically adaptable to interconnection at their coincidence points.

Therefore, it is vitally important to note here, in considering both near-term and long-term construction of cable systems, the potential applications which demand that expanded cable use be a major consideration in all subsequent telecommunications planning.

Duplicative Distribution Systems and Future Expansion

If Maps 1-4 were to be superimposed or overlaid, that is, those maps representing substantially all of the microwave systems in the Commonwealth that are either owned or controlled by the state, independent, and/or nonprofit agencies, there would be surprisingly little absolute duplication. Visually, routes may appear to overlap, or at least join common points even though the geographic routes may be different, but this does not mean that duplication exists. From a technical standpoint, the capacities of the systems--both in terms of sufficiency for increased traffic and in terms of the technical specifications to carry video, audio, and/or data--can and do differ markedly.

For example, although both PPTN and the Pennsylvania Turnpike Commission maintain microwave systems linking the Harrisburg/Hershey and Pittsburgh, Philadelphia, and Scranton areas, the services cannot be considered to be duplicative because of the volume of traffic transmitted and the difference in the nature of the transmission characteristics. The primary use of the Turnpike system is message

traffic voice-grade, while a high quality video and audio signal is the primary use of the PPTN system.

There are, however, potential advantages which could be realized through the future use of capacities not now fully utilized. Several portions of the Turnpike system are currently capable of accepting up to 300 more message channels than are currently being used. A number of microwave systems operated by the Pennsylvania State Police are capable of similar expansion to provide more capacity for message traffic. Further potential lies in the construction of short additional links to extend the existing systems into urban areas, such as one which could connect the Turnpike system to the center of Pittsburgh. In addition, interconnecting systems which now function independently would provide statewide communications systems at a marked reduction in cost.

Additional cost advantages may be realized through the use of existing facilities when new circuit construction is required. Microwave systems consist of more than simply the electronic equipment involved. There is a considerable investment in land, towers, buildings, and certain antennae structures which could be put to additional use and thereby substantially reduce the cost of new installations.

Similarly, the Department of Education television facility in Harrisburg (see Origination Facilities below), by virtue of its location in the tallest structure in the metropolitan area, potentially may serve as a critical interconnection point to present and

future state microwave services. Such interconnection would provide immediate statewide access directly from the capitol complex through the existing microwave and cable networks of PPTN and the Pennsylvania Educational Communications System for use in teleconferencing, in-service training, and emergency or governmental communications.

Even further interconnection may be obtained by establishing circuits between the Department of Education facility and other buildings in the capitol complex through newer technologies such as optical transmission devices, portable microwave links, and/or fiber-optic or conventional cable laid through existing and new conduit now being installed in conjunction with the Harrisburg CATV system. These installations could provide immediate access to the Governor's Office, the legislative chambers, the Department of Transportation studio, and the Pennsylvania Emergency Management Agency.

2. Origination Facilities

There are two significant audio/video recording installations within the capitol complex at Harrisburg: one at the Department of Education, and the other at the Department of Transportation. Both the Department of Education facility and that of the Department of Transportation function independently of each other. As noted above, although separated by less than one-half mile, presently there is no electronic interconnection between the two.

The Department of Education facility is managed by the Division of Educational Media of the Bureau of Press and Communications. Originally created for the primary purpose of duplicating videotapes for educational distribution, this unit has evolved into the sole facility with broadcast quality equipment controlled by state government. A major expansion of the facility took place in 1979: it now consists of (1) a studio equipped with three broadcast-quality cameras and installed lighting with full dimmer control; (2) a studio control area incorporating audio mixing with tape and disc reproduction, video special effects, and character generator; and (3) an equipment area containing studio camera controls, two-inch, three-quarter-inch, and one-half-inch video recorders, cassette and reel-to-reel audio recorders and duplicators, and film reproduction equipment. There is also a scene-storage and construction area adjacent to the studio and a film and tape library accessible from the equipment area.

The basic activity of the Department of Education facility continues to be the duplication of instructional videotapes for school and other educational institutional use. Production of informational announcements and intradepartmental training materials has been initiated, and plans exist for the introduction of teleconferencing and other teacher training activities as policy and staff capabilities permit.

The Department of Transportation facility is managed by Commonwealth Photographic Services of the Office of Press and

Legislative Affairs as an extension of its fundamental role of providing motion and still photographic services to all Commonwealth agencies. While still in the developmental stage, the installation currently consists of a small studio area with two electronic field-production-type cameras and an adjacent control room equipped with a video switcher incorporating modest special effects complemented by an audio mixer and three-quarter-inch videotape recorders with editing capability.

Although maintaining a deliberate policy of gradual involvement in video activity, the Department of Transportation has successfully used its television facility to convey departmental policy statements to its dispersed field offices during recent major organizational changes and to produce informational announcements principally about highway safety. As the development of audio/video expertise and equipment procurement continues, the Department plans to extend enhanced services to other agencies similar to the way it now offers photographic services.

Duplication Among Origination Facilities

These and other audio/video facilities in use by both state government and nonprofit organizations are too limited and disparate to be considered duplicative at least for the moment. It is clearly evident, however, that the lack of any coordinating structure, to assist both in defining future equipment needs and in coordinating procurement, raises the promise not only of equipment proliferation but also of expanded acquisition of incompatible

electronic formats. Obviously, such developments would result in widespread and unnecessary duplication. As noted elsewhere in this report, personal interviews revealed a high interest among government agencies and nonprofit groups to use aural/visual techniques to effect operational cost savings as well as to expand and improve a wide variety of services through telecommunications technology. Under present policies, equipment specifications and design responsibilities rest with each individual organization. As additional equipment is acquired, such basic decisions as the selection of one particular videotape format instead of one of several others available could easily result in an inability to conduct interagency or interorganizational exchange simply because of different and incompatible formats.

Further, providing general compatibility of equipment would not be the only benefit of a coordinated approach. Coordinating the acquisition of audio/video equipment and supplies also can lead to significant cost savings through common purchase of specific equipment or through commonly offered price reductions for high volume users. For example, the coordination of videotape sales through the Eastern Educational Television Network and the Public Broadcasting Service affords Pennsylvania public television stations reductions of up to 40 percent of those prices afforded low-volume individual purchasers.

Equipment Maintenance

All but the most minor equipment maintenance functions in both of these origination facilities are performed by outside contractors. With the present inventory of equipment, this is likely the most efficient means of performing this function since it sharply reduces the need for highly trained personnel who would probably be underutilized now. Given the interest and desires expressed by other agencies in the use of aural/visual techniques, however, and the predictable expanded use of audio/video equipment, it is clear that this maintenance procedure should be closely monitored for adequate performance and response.

A major drawback to vendor-performed maintenance is the unavailability of equipment for what may be extended periods of time while the equipment is removed to the vendor's facility, repaired, and subsequently returned. Increased use of audio/video equipment and expanded reliance upon that equipment to perform regularly and reliably means that any extended lost-use period will result in sharp decreases in efficiencies and disenchantment with the techniques. This will be followed by marked increases in costs if additional equipment is procured to sustain expanded levels of activity without having first solved the problem of out-of-service and nonproductive equipment due to inefficient maintenance procedures.

3. Broadcast Transmission

Composite coverage patterns of all Pennsylvania class A and B* public radio stations, public television stations, and TV translators have been prepared using the AreaPop database, which makes computerized projections based on such factors as transmitter power, radiation pattern, antenna height and gain, and topography.

Television

Clearly, the topography of the Commonwealth presents a major difficulty toward achieving full television coverage of the entire state. While providing geographic coverage to only about 90 percent of the Commonwealth, judicious planning in location of stations now broadcasting, however, has made public television service available to some 99 percent of the population. The dominant geographical feature is a series of mountain ranges which extend roughly from the northeast to the southwest corners of the state. These ranges have an average altitude of 2000 feet with intervening valleys of an average elevation of 500 feet. Thus, population centers in many semirural areas of the Commonwealth which are generally in the valley areas are prevented from receiving any television signal which does not radiate directly into the valley itself.

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*Generally, class A stations have an effective radiated power below 3000 watts; class B power is below 50,000 watts.

Historically, broadcasters in these regions have employed two methods in an attempt to extend their signal to the largest possible audience:

-Situating the transmitting antenna at the highest point possible while maintaining a site permitting maximum reach into valleys, so as to minimize signal "shadow" problems.

-Employing translator (repeater) stations to redirect signals into otherwise inaccessible and shadowed population centers.

The desire for television reception by would-be viewers has also led to the use of extraordinary accommodations on their part. Using high towers for antenna mounting, situating the receiving antenna at a distance from the TV receiver site, and accepting a lower picture/sound signal quality than is usually tolerated are but a few of the approaches taken.

Indeed, the difficult terrain features encountered when combined with this viewer desire led to the birth of cable television in Pennsylvania. At present nearly 1300 communities within the Commonwealth are served by a variety of cable companies ranging from the most sophisticated multi-channel systems to simple family-oriented associations providing only off-the-air reception.

These factors of terrain, the use of sophisticated receiving antennae, the acceptance of "fringe" quality signals in some areas, and the proliferation of cable must be given consideration in determining the extent of public television coverage within the state.

Map 5 shows the AreaPop computed grade-B* coverage areas of the eight Pennsylvania public television stations with the addition of the translator station systems operated by stations WVIA-TV and WITF-TV.

As noted earlier, the projected television coverage reflects the ability to reach about 90 percent of the state's geographic area by broadcast transmission. To truly assess population coverage, consideration was given to the enhancement capabilities of cable systems and, in the most rural areas, the use of sophisticated antennae and the acceptance of "fringe" signals. For example, the area of apparent lack of coverage between station WPSX-TV on the west and stations WVIA-TV and WITF-TV on the east is among the most heavily cable-populated in the Commonwealth. In addition, observation has shown that, in the most rural portions of this area, the use of elaborate antennae and the proximity of a reasonably strong signal affords an extremely high reception capability. A similar situation obtains in the area bordered by WVIA-TV on the north and WITF-TV on the south; in the area bordered by WPSX-TV on the east, WQLN-TV on the north, and WQED-TV on the south; and in the small area of Bradford County north of WPSX-TV.

However, quite a different situation applies in the region comprised of the southern parts of Somerset, Bedford, and Fulton Counties outside the coverage area of WPSX-TV. In this largely

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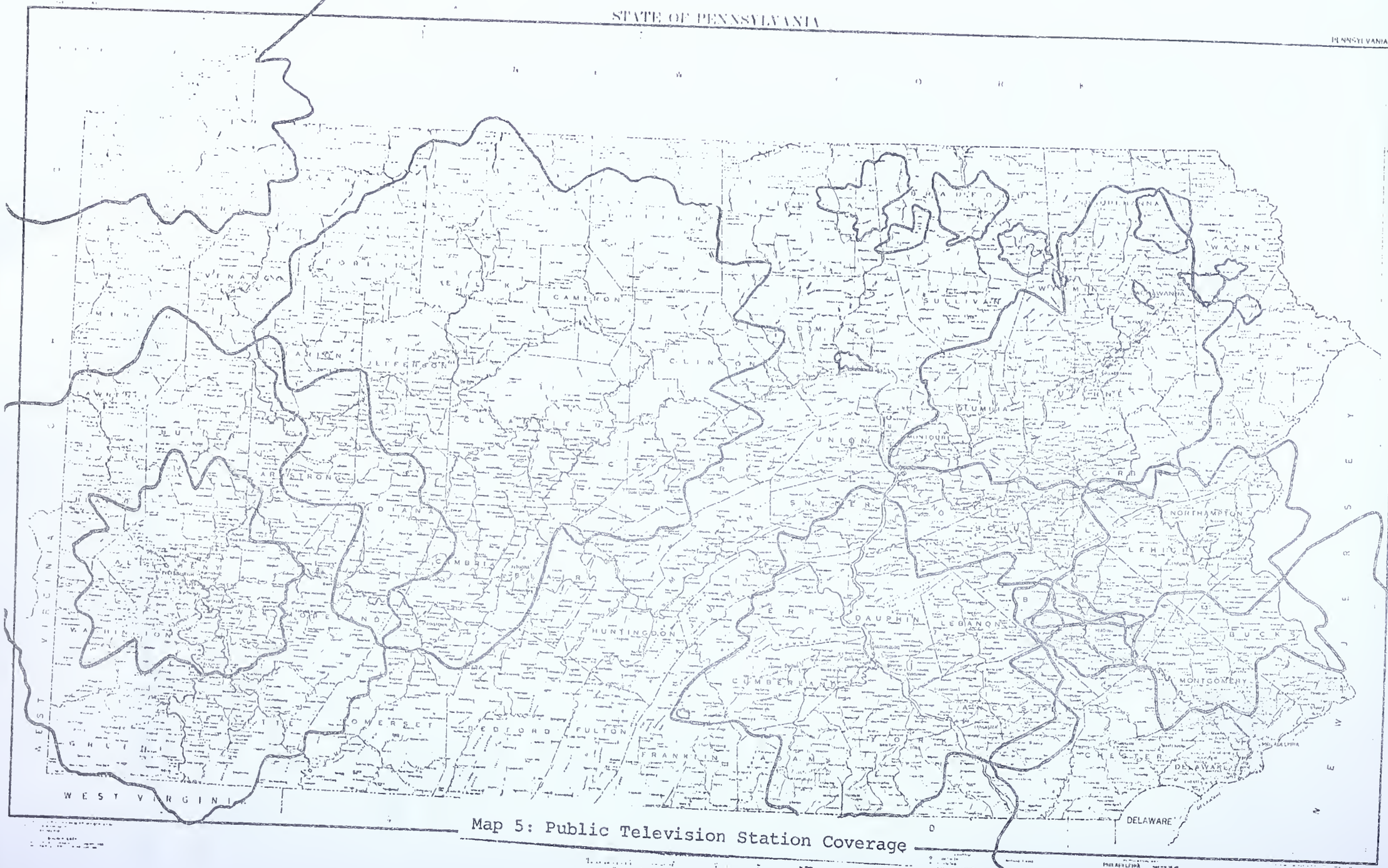
*Grade B defines a station's principal service area through a computation of radiated power, antenna height and design, and terrain contour.



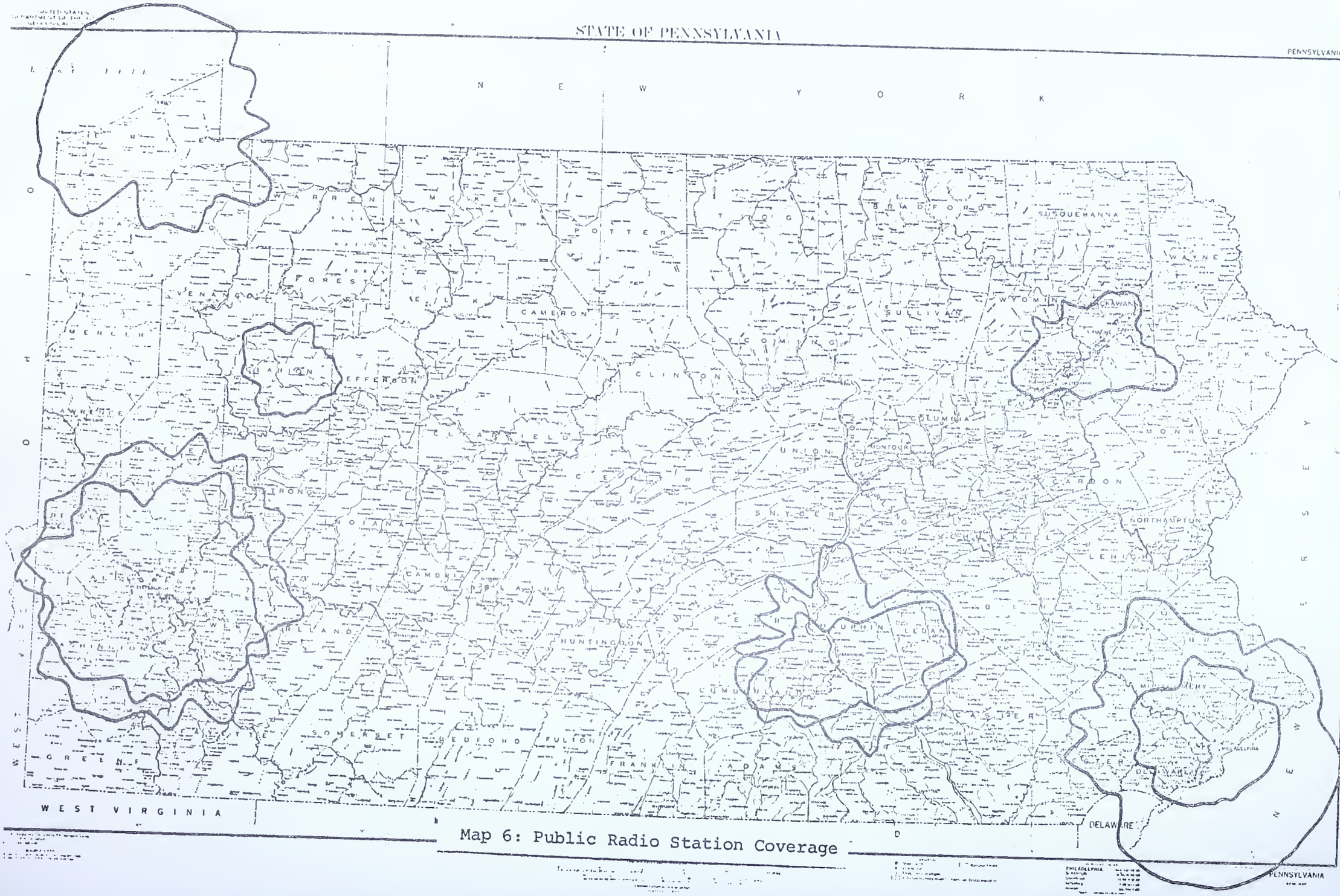
Map 5: Public Television Station Coverage

rural area, cable systems do not abound but, in general, are limited to those more heavily settled communities. Furthermore, even in instances where cable systems exist, a significant number carry no Pennsylvania public television stations. Therefore, a large portion of the approximately 70,000 persons in this region have no access to social, public affairs, sports, educational, and cultural broadcasts originating within their own state.

Field surveys, conducted under contract to this study by WPSX-TV, demonstrate the ability to receive translator-usable signals from at least one public television station at several selected mountaintop sites within this region. The installation of three 1000-watt ERP translator stations, utilizing combinations of omnidirectional and configured-pattern antennas at specific locations within the region, has the potential of significantly increasing viewer access to the Pennsylvania public television system by off-air reception and the high probability of encouraging carriage by local cable systems.

Radio

In regard to radio, Pennsylvania public radio now serves approximately 88 percent of the population of the Commonwealth. Map 6 depicts the grade-B public radio coverage and was developed using the same methods and AreaPop projections as were used in the development of Map 5 showing television coverage. It is important to recognize that, at present, there are no public AM radio stations within the Commonwealth.



Map 6: Public Radio Station Coverage

Since FM radio exhibits essentially the same line-of-sight propagation limitation as low-band VHF television, the difficulties presented by topographical formation discussed in regard to television are equally applicable to radio. However, the quality of the FM radio transmission consistently permits excellent reception beyond the grade B contour. On-site tests have proven that better-than-adequate reception exists in many areas which Map 6 indicates as being beyond the grade B signal. For example, tests have shown that quality reception exists through the westernmost portion of the state, although a gap is indicated on the map between Pittsburgh and Erie. A similar full-coverage situation exists in the eastern and east-central portions of the Commonwealth.

However, a serious lack of public radio service does, indeed, exist in the central portion of the Commonwealth. This area includes the major urban areas of Altoona and Johnstown as well as a number of smaller communities and a large rural population constituting a composite unserved population of over one million.

Public radio planners have long recognized the need to extend coverage to this large part of the state. However, both the size of the region to be serviced and the topography, which features high, sharply defined ridges crossing the service zone, have been deterrents to the establishment of traditional public FM radio. For example, the construction of a high-power, high-antenna FM station in a central part of the region--even considering good

reception beyond the grade B contour--would provide only marginal signals to the area edge. Further, many communities located in valleys would receive no signal even though they are within a strong signal area because they are "shadowed" by the steep mountain ridges. Siting studies prepared by the Pennsylvania Department of Education indicate that more than a dozen FM stations would be needed to provide even an acceptable, much less complete, public radio service coverage to this region of the Commonwealth.

The conventional solution to this kind of problem has been to utilize AM radio rather than rely on FM with its lesser coverage potential. That is, AM radio, because of its superior propagation characteristics and lack of subjugation to line-of-sight limitations, does have the ability to service the entire region and can overcome the problem presented by the terrain. Until recently, however, its use has not been possible because of a lack of available broadcast frequencies, but actions in the past few years by the Federal Communications Commission now allow wider use of frequencies assigned as "clear channels." This new authority presents an opportunity to provide a public radio service to the region, both reliably and at a reasonable cost. A centrally located single 50,000-watt AM station, even though subject to nighttime power and pattern restrictions, would provide service from the New York to the Maryland borders and to the entire central part of the Commonwealth. Through its Commonwealth Educational Network division, the Pennsylvania State University has proposed

such a station to the Federal Communications Commission for authorization and to the National Telecommunications and Information Administration for funding.

C. Survey Results

The overall objective of the PPTN survey (Appendix B) was to make a qualitative assessment of how messages currently flow among state government agencies and nonprofit organizations, along with the volume and mode of delivery of such communications, as determined by the survey respondents (Appendix C). Approximately 500 survey forms were mailed to state governmental agencies and 250 forms were sent to nonprofit organizations. There was a 26 percent response rate in the nonprofit sector and a combined response rate of 95 percent among governmental agencies, that is, when the fact is taken into consideration that a number of divisions within agencies which received forms chose to combine their responses. Summary statistical results of the survey responses are included in Appendix D; the complete detailed responses are on file.

The questionnaire results identify organizations with telecommunications resources and activities and also serve to lay the groundwork for future investigations, as required, so that specific recommendations for telecommunications facilities, and their utilization to meet identified Commonwealth needs, may be formulated.

The categories and designations stated below are essential to both a presentation and an understanding of the first part of the survey results. The various questions in the survey were posed and are examined in terms of:

Survey Group Categories: state government agencies, nonprofit organizations, and the general public;

Message-Type Categories: information, action advice, records, statistics, licensing/testing, and electronic data processing;

Communication-Flow Modes: the "provision to," "reception from," and/or "exchange with" directions of messages; and

Interaction Modes: mail, telephone, personal contact, or other.

Later sections of the survey instrument solicited information regarding the use of broadcast radio and television, the use of audio/video equipment in training and communication, current frequency of meetings along with future predictions, and the use of dedicated circuitry.

The following narrative presents the basic information generated by the survey responses:

1. Survey Group Categories

In comparing the activities of state agencies, nonprofit organizations, and the general public, there was little variation within types in terms of the direction of communication flow, volume of the various message types, or interaction modes of each message type.

"Information," as a message type, had by far the greatest volume among the survey groups. When all interaction modes are combined, "Information" accounted for 33 percent of all interaction with state agencies, 35 percent of the interaction with nonprofit organizations, and 41 percent of the interaction with the general public. Volume for "Action Advice" ranked second, followed by "Statistics," "Records," "Licensing/Testing," and "Electronic Data Processing" in all three survey group categories.

Examination of the separate interaction modes showed that "Mail" was considered to be the most frequently used mode of interaction by a vast majority of the respondents, with about three-fourths or more of each survey group category citing such use. The second most used interaction mode was "Telephone," cited by about two-thirds of the respondents, followed by "Personal Contact" and "Other."

2. Message Type Categories

When analyzed by "message type," the following results were obtained. Looking at combined totals for all groups, state agencies had 41 percent of the total for "Information" and 43 percent of the total of all "Action Advice" message types. State agencies showed 68 percent of the total for "Electronic Data Processing" and 57 percent of the total for "Statistics."

Further analysis broke down the returns into separate survey group categories. Message type flow was examined in the following four configurations:

- Among only state government agencies;
- Among only nonprofit organizations;
- Between government agencies and nonprofit organizations; and
- Between government agencies and nonprofit organizations with the general public.

Among just state agencies, there is a substantial message flow, primarily in the category of "Information." Of those responding, 61 percent noted the provision of "Information" to

other agencies, 52 percent noted that they received "Information" from other agencies, and 35 percent responded that they exchanged "Information" with other agencies at "moderate" and "substantial" levels of activity. In addition, an average of 20 percent of the respondents specified a "low" level of activity within the message flow categories.

A significant message flow also takes place between organizations in the nonprofit sector. This activity, like that among state government agencies, is also concentrated in the categories of "Action Advice" and "Information." Some 60 percent of the respondents in the nonprofit sector indicated that they provided "Information" to other organizations at "moderate" and "substantial" levels, and 47 percent provided "Action Advice." An average of 35 percent indicated reception and exchange activity in the same message flow categories.

Substantial message flow also exists between organizations in the nonprofit group and governmental agencies. In the category of "Information," 44 percent reported providing messages at a "moderate" or "substantial" level, 50 percent reported receiving, and 60 percent exchanged messages.

Communication flow with the general public was generally concentrated in the "provide" mode, again in the category of "Information," with the nonprofit sector indicating 50 percent at a "moderate" or "substantial" level, while state agencies reported a 60 percent level of activity.

3. Communication Flow Modes

Specific analysis of "communication flow modes" showed that the most distinctive results were those dealing with state agencies. Of the total activities where "reception from" messages were involved, 52 percent were receiving messages from state agencies. Where "exchange with" messages were involved, 47 percent of the total were exchanging messages with state agencies.

4. Interaction Modes

"Mail" was not only the most frequently used interaction mode among survey groups, it was also the most frequently used means of delivering messages among all message types. By survey groups, some 83 percent of government agency respondents indicated "Mail" use for "Information" distribution with other agencies. In the nonprofit sector, "Mail" was the most favored means of delivery of "Information" at 89 percent, while delivery of "Action Advice" was evenly divided between "Mail," "Telephone," and "Personal Contact" at 65 percent. "Mail" was also the most used method to deliver "Information" to the general public, with a more than 70 percent use level by both state agencies and nonprofit organizations.

The lowest that the "Mail" category ranked among interaction modes was in the area of "Action Advice" messages, which nevertheless provided for 34 percent of all "Action Advice" messages and was tied (with "Telephone") for the highest ranking among all modes

of distributing "Action Advice." "Mail" was used 50 percent of the time for "Records" and 48 percent of the time for "Statistics."

Not surprisingly, the "Telephone" mode of interaction had its greatest volume in the area of "Action Advice" (tied with "Mail" as noted above). The "Telephone" interaction mode ranked second in the "Information" and "Statistics" message-type categories. "Personal Contact" ranked higher in use than the "Telephone" in the "Licensing/Testing" and "Records" message-type categories.

5. Utilization of TV or Quality Audio

In the survey results dealing with the utilization of television and quality audio, broadcast radio and television were reported to be used by more than 50 percent of the organizations in the nonprofit sector and by nearly 25 percent of the government agencies responding. Of those respondents indicating that closed-circuit TV or audio was utilized, the primary delivery mode was via taped materials as opposed to "live" presentation. The majority of respondents indicated that the most frequent activity was to utilize radio to deliver "Public Information" (31 percent). "In-Service Training" ranked a distant second (9 percent), and "Conducting Business" ranked third.

6. Dedicated Circuit Inventory

Survey results in regard to dedicated circuits showed that 31 percent of all respondents indicated that their organizations maintained dedicated circuits, and approximately 50 percent of those

circuits are between a given agency's headquarters and its field offices. Thirty percent of those organizations with dedicated circuits maintained them between a respondent's own agency and state agencies.

7. Meeting-Oriented Activities

In the survey section where respondents were requested to estimate the volume of meeting-oriented (as distinct from person-to-person) activities, both at present and in the future, there were the following results among the four options given. "Conferences" and "Seminars" were about equal in number of mentions, followed by "Interagency Meetings," with "Hearings/Public Meetings" being the least frequently used form, by a substantial margin. "Occasional" use was by far the most common response of the three options given for the occurrence of meeting activities. Second choice was "Frequent." "Never" was cited less than 10 percent in all meeting categories except "Hearing/Public Meetings," where the percentage was in the mid-teens. In terms of current involvement and projections for future meetings, the percentage of "Never" went down, and the percent of "Frequent" went up in every instance except one where it remained the same.

8. Geographic Distribution

Two interesting, though not surprising, results were generated by examining the returned surveys on a geographic basis: the three heavily populated areas of the state (Harrisburg,

Pittsburgh, and Philadelphia) accounted for (1) 63 percent of the nonprofit organizations, and (2) 88 percent of the state agencies responding, with the heaviest concentration in Harrisburg.

Further, Harrisburg proved to be the area where a majority (55 percent) of the respondents indicated that their organizations maintained dedicated circuits from their agency to field offices or other organizations. The same is true of those using closed-circuit television or audio, with organizations in Harrisburg accounting for 63 percent of the total volume of closed-circuit activities.

D. Discussion

The preceding section presented selected statistical data based on the returns from the PPTN survey, synthesized on the basis of survey group categories, message types, direction of communication flow, and various interaction modes. This section is a discussion and analysis of the more pertinent findings.

1. Communication Types and Flow

Message exchange among only government agencies is concentrated in the single area of "Information," while the volume of message exchange among only community nonprofit organizations is about an equally high concentration among two types: "Information" and "Action Advice." Message flow between government and community organizations is generally reciprocal, in that they both "provide" and/or "receive" about the same amount of information from each other. In contrast, communication from these two groups with the

general public is almost totally a one-way flow from the organizations as they provide information to the public.

Additional analysis of reports from governmental groups indicates that, while a significant level of communication to the nonprofit sector exists throughout government, the substantial portion of this message flow involves the Departments of Health, Education, and Public Welfare.

2. Interaction and EDP

As has been reported, the use of the "Telephone" and "Mail" constitute the major means of interaction among all groups, with "Personal Contact" the next most utilized method; the use of "Other" methods was insignificant. Interestingly, although both pre-survey and follow-up interviews indicated a widespread reliance on data-bank stored information, in community groups as well as in government agencies, there was very little employment of EDP techniques for the distribution of information. Such a result is attributable to the lack of economical EDP communications circuitry as well as to incompatibility among the various makes and models of EDP equipment.

It can be readily anticipated that the principal method of exchanging information between government agencies will be EDP communication, following the installation of the Commonwealth Computer Communications System which is now in its initial phase. This system will provide a cohesive communications network with a

modular node system allowing access at all major activity centers in the Commonwealth. Further, the extensive use of emulation techniques is predicted to overcome, almost fully, the difficulties caused by machine incompatibilities.

Implementation of the Commonwealth EDP Communications System, in addition to allowing an interactive processing of data among agencies and the facilitation of information exchange, will permit savings in the areas of cost and time by eliminating the need for extensive personnel intervention in the communication exchange process. As the survey results have shown, the current most-used interaction modes are "Telephone" and "Mail," both of which involve substantial costs. Specifically, present state average nonmanagement salaries are $10.90 per hour, and the average cost of an individual piece of correspondence is more than $7. A noticeable cost savings may be realized by increasing the use of EDP and reducing not only those costs associated with the purchase of telephone time or a postage meter but also the amount of personnel time involved.

Under current plans, the savings to be realized from the use of the EDP network will be confined primarily to government agencies and will extend the benefits neither to message flow between government agencies and the public nor to message flow between government agencies and community organizations. Further, it will not allow for the improvement of cost factors for message

flow among community organizations themselves nor to their communications with the public.

Since state agencies exchange a substantial amount of information with the nonprofit sector, it is apparent that the Commonwealth could realize further cost savings by allowing direct interactive access to the Commonwealth EDP Network by those organizations having a substantial information exchange with state agencies.

3. Teletext and Captioning

A much different approach must be employed if efficiencies are to be realized in communicating with the general public because of the numbers involved and the need to individualize the messages. While many of the information needs of the public can be well-satisfied through the print media, public radio and television programming, and the broadcast of public service announcements, such means do not respond to individuals' needs for specific information at specific times. There are, however, available methods to satisfy this need to a large degree while still realizing savings from the elimination of personnel intervention and inquiry-response research. One method is teletext--the generic term for systems which encode printed information in a television broadcast signal and permit the selection of individual "pages" of information by a decoder-equipped user. This method has the ability to broadly distribute a significant amount of commonly required information

in such areas as health, occupational, and human services, for example. While teletext is already being used for just these purposes in other countries, it still remains in the test stage in this country as the FCC considers a staff recommendation for authorization.

However, a less sophisticated form of teletext, differing only in capacity and the freedom of individual user selection, is in general use and can be immediately utilized to attain the above goals. This system is the closed-captioning process developed by the Public Broadcasting Service in which the text does not appear on the screen without a special decoder. It also provides two channels of text transmission which may be utilized for a variety of purposes in addition to the closed-captioning service.

4. Use of Audio/Video Equipment

Response to the survey revealed a significant use of broadcast radio and television among government agencies and nonprofit organizations. Follow-up interviews determined that this activity was primarily for informational public service announcements and concentrated on radio, essentially because of economic considerations.

Although intense interest was expressed during the course of the personal interviews, compiled responses indicate that insignificant activity is taking place which utilizes audio/video equipment for training or general education purposes. Follow-up interviews also indicated that while the decision to forego the use of this

equipment was apparently economic, such result was often the case because of the inability to impress upon those at the decision-making level the appropriateness and/or efficiency of this technology.

A further purpose of the questions dealing with the use of audio/video equipment was to inventory this type of equipment. Survey responses indicated an extremely low incidence of audio/video equipment possession in both governmental organizations and in community groups. Follow-up interviews revealed a certain amount of confusion on the part of respondents between audio/video equipment and video display terminals associated with computer equipment, which served to cloud the issue and temper the usefulness of the survey results.

However, based on the information gained from in-person and follow-up telephone interviews, it can be concluded that with the exception of those installations discussed under section B above dealing with inventory, there is little use of audio/video equipment by either state agencies or community organizations.

5. Dedicated Circuits

Similarly, there was found to be a very low incidence of the use of dedicated communication circuits. Follow-up interviews determined that those dedicated circuits were primarily voice-grade circuits associated with computer communications. Again, there was

some confusion. This time it was not clear that the proper distinction was being made between dedicated circuits and specialized dial-up services such as WATS and independent networks.

6. Meetings

From the responses dealing with involvement in specified meeting types, it is interesting to note that there were fewer organizations which indicated "Never" in regard to future meetings than responded "Never" to current activities. While the drop of only a few percentage points would not normally be considered noteworthy, the fact that the projection of future activity immediately follows the report of current practice on the survey instrument, plus the fact that the same organizations responded to both questions, clearly indicated both the respondents' understanding of the importance of meeting-oriented activities and the direction of intended change.

Similarly, while no major increase in the overall frequency of meetings is evidenced, there is a clear indication of a shift from "Never" and "Occasional" to "Frequent." Of further significance is the change in the purpose of the projected meetings, with a decrease in meetings anticipated for agency communication and a greater emphasis on the types of meetings involving persons outside the agency. Follow-up telephone interviews revealed the recognition, on the part of respondents, of future budgetary limitations and the need to restrict this communication form despite

the desirability of an increase in such activity. The decrease in projected interagency activity was a reflection of the view that this was the activity most easily controlled and was highly susceptible to replacement by other methods for the purpose of conserving funds.

Teleconferencing as a means to meet these projected needs was not suggested in the survey instrument, of course. However, the results clearly indicated that teleconferencing be given serious consideration in future planning to help satisfy such needs.

III. CONCLUSIONS AND NEEDS

A. Audio/Video Equipment: Commonwealth Non-Broadcast

1. Usage and Coordination

The use of aural/visual techniques for such activities as public information, training, and intradepartmental communications is currently determined at the agency level. While some agencies possess the expertise necessary for efficient utilization of the technologies involved, most do not. The result is a range of situations varying from well-equipped and well-staffed facilities, some of which are significantly underutilized, to agencies lacking any audio/video equipment but having both a well-founded desire and useful applications. Proper use of such facilities could enhance operations and create cost efficiencies.

Therefore, there is a need for a coordinated, informed policy to assist state agencies in assessing the elements for and proper application of aural/visual techniques, to aggregate multiagency usage of existing facilities, and to encourage the examination of operational functions for the purpose of evaluating aural/visual applications to ensure the greatest benefit to the users.

2. Procurement

The actual process of procurement, involving the preparation of requests for proposals, the acceptance of bids and their evaluation,

and the awarding of contracts, is now centralized in the Department of General Services. However, according to state policies and practices, the formulation of basic specifications for audio/video equipment remains the responsibility of each individual agency and, most often, reflects a higher degree of emphasis on budgetary restrictions, equipment availability, and vendor persuasiveness than on the requirements of the activity in which the equipment is to be used.

Therefore, there is a need for a logical, comprehensive governmental procurement policy, coupled with expert guidance at the technical level, to ensure that the equipment acquired is of suitable character, is compatible with other items of like equipment, and is obtained in sufficient quantity to satisfy the user demands, in addition to maintaining those procedures designed to assure proper function and best price.

3. Maintenance

Examination of existing procedures indicates that each agency which possesses audio/video equipment presently is individually responsible for its maintenance and repair. While a very few of these agencies have technicians of varying degrees of skill, most do not; and the performance of this function is generally delegated to equipment distributors and manufacturers' service organizations. As the use of this equipment becomes more widespread, its importance as an integral part of Commonwealth operations will increase,

and the delays and wasted efforts resulting from inoperative equipment, which are the inevitable return of the existing policy, will be far more significant.

Therefore, there is a need for the establishment of a system to effect a preventive maintenance procedure for telecommunications equipment, as well as timely repair, and, assuming a commonality of equipment issuing from a comprehensive governmental procurement policy, the ability to exchange or loan equipment to further shorten the downtime cycle.

B. Audio/Video Equipment: Nonprofit Sector

1. Relationships to Commonwealth

Survey results confirm a substantial information flow between Commonwealth agencies and nonprofit public service agencies. The results also indicate that the most frequently used methods of distribution are those which entail high expenses in compilation and distribution: mail, telephone, and personal contact. The expense associated with this activity accrues to both the Commonwealth and the individual organization which, in turn, often receives financial support from the Commonwealth. Therefore, it would appear that mutual benefits could derive from the sharing of telecommunications services between these entities.

Therefore, toward that end, and within statutory limitations, there is a need for reexamination of state telecommunications service provision policies, especially to allow the formation of

nongovernmental telecommunications cooperatives to aggregate user requirements, so as to better benefit from the efficiencies of telecommunications.

2. Procurement and Maintenance

Since examination of the Commonwealth budget indicates that substantial funds are appropriated, either directly or indirectly, to local government or nongovernmental organizations active in such fields as health, welfare, and social service, additional benefits in the enhancement of services and utilization of funds can be realized by extending access to a coordinated equipment procurement policy beyond the limits of state government.

Arrangements should be made to allow those elements of the nonprofit sector which supplement governmental functions to participate in both the procurement and maintenance functions regarding Commonwealth audio/video equipment described in Section A.

Therefore, there is a need for extended agreements under state procurement procedures, similar in nature to the process extending purchase agreements to local governments, which would allow nonprofit organizations the benefit of mass-purchasing of audio/video equipment; combined with a comparable maintenance procedure, there would be a resultant efficiency of resource utilization and an increase in the capacity to employ aural/visual techniques for the general welfare.

C. Interconnection/Distribution

1. Computer System and Other Techniques

The Commonwealth has formulated a plan for a comprehensive computer communications system and has undertaken the processes necessary to put the plan into effect. However, this plan is directed toward computer-to-computer communication and takes only peripheral notice of other data-base techniques such as computer conferencing, teletext and videotext distribution, and facsimile distribution. The advantages of such data-base techniques should be seized when they are functionally available.

Therefore, there is a need for the formulation of a policy which will foster a methodology to evaluate the applicability of data-base approaches to the comprehensive Commonwealth Computer Communications system and to encourage the timely implementation of a variety of such approaches, including utilization of cable systems.

2. Microwave System

Survey results indicate that microwave usage is conducted according to individual agency requirements. The consequence of such procedures has been a proliferation of circuits which, while efficient in their discrete activities of distributing data, video, and voice, could realize greater efficiencies through frequency-shared or time-shared multiagency use.

Therefore, there is a need for procedures which would establish microwave circuits on a Commonwealth basis rather than by state

agency use; such procedures would allow interconnection between existing microwave circuits to form regional or statewide networks and also provide for coordination of circuits in conjunction with the Commonwealth Computer Communications Project.

3. Public Radio System

Although Pennsylvania enjoys the service of a number of public radio stations, it is a matter of record that no consistent system provides interconnection between them, even those colocated at public television stations for which PPTN provides interconnection. This situation persists, despite the fact that the circuitry necessary to establish such an interconnection is in place, because no statuatory authorization exists. The lack of such a system precludes the ability of public radio stations to share emergency messages, programming, programming resources, and equipment usage; it also prevents realization of the cost savings which could result from mutual efforts. The lack of an interconnection facility also limits any ability to utilize public radio subsidiary communications capability (SCA) for specialized statewide services.

Therefore, there is a need for statutory authorization which will enable the Pennsylvania Public Television Network to provide interconnection service to public radio stations colocated with public television stations.

4. Public Television Network System

Mass communications in time of emergency are currently available through the Pennsylvania Emergency Broadcast System on an aural basis only. Investigations carried out as a part of this study determined that direct television transmission and communication during times when no emergency is declared, such as the situation encountered during the 1979 Three Mile Island incident, must rely on the voluntary cooperative effort of broadcast organizations. Further, making such communication technically possible entails the time-consuming process of determining circuit availability and the subsequent configuration to reach each television station.

Therefore, there is a need to establish dedicated circuitry which would provide Commonwealth leaders with direct access to the Pennsylvania Public Television Network, the only facility which allows instantaneous television access to virtually all citizens in the Commonwealth.

D. Public Broadcasting Coverage

1. Public Radio Service

According to computerized projections and field surveys, a significant portion of central Pennsylvania, which is composed largely of rural populations but also includes the urban complexes of Altoona and Johnstown, lacks adequate radio service.

Therefore, there is a need to have public radio available in the central part of the state to provide the citizens there with both the traditional cultural and informational programming of public radio.

2. Public Television Service

Computerized projections and field surveys also show that public television stations now provide service to the vast majority of the state's population. However, there is a defined cohesive area of the southwest central part of the state which is devoid of Pennsylvania public television service, since only generic public television service is provided by other states (principally by Maryland).

Therefore, there is a need for the citizens of southwest central Pennsylvania to have access comparable to the rest of the state to the arts, cultural, and routine or emergency governmental information programming provided by public television stations from within their own state.

3. Increased Utilization

It is a matter of record that over a number of years the Commonwealth has invested substantial sums in support of public broadcasting facilities and programming. In these times of reduced spending at both the federal and state levels, it is more important than ever for the Commonwealth to continue to realize benefits from this investment.

Therefore, there is a need to reexamine governmental operational practices and policies toward the goal of increased utilization of public broadcasting facilities for Commonwealth communications purposes, especially in non-broadcast production and distribution activities.

E. Emerging Technologies

Economies of present communications usage clearly indicate that terrestrial communications systems are the most efficient form within the Commonwealth. This situation, however, may change drastically with the advent of increased data and visual communication requirements for greater interstate governmental and public service organization communication and changes in the economics and technology of space communications.

Therefore, there is a need for continual monitoring of communication techniques and technology developments to ensure that the instant capability exists to evaluate both the advantages and disadvantages of new developments so that consequent efficiencies and cost-effective use can be accurately determined.

F. Implementation and Future Development

Throughout this study and the identification of existing and future telecommunications needs within the Commonwealth structure, many situations were found which would require administrative coordination and, in some cases, the development of interagency cooperative procedures for resolving these situations in a rational, timely, and effective manner. Such procedures would be necessary in Section A above for state agencies

and to some degree in B, C, and D, with the appropriate involvement of the nonprofit sector and other concerned entities, including PPTN. As new technologies are developed (such as those in E above), as training activities are expanded, and as new aural/visual techniques are accepted into the operational practices of the Commonwealth, it is imperative that a continuous needs identification and monitoring program be undertaken. Further, methodology must be established to allow the Commonwealth to realize the most efficient and beneficial application of those technologies in addition to providing a clearinghouse function to make information regarding emerging technologies and their application available to the user community.

Therefore, there is a need for an ongoing interagency body to coordinate, advise, advocate, and assist in the development of Commonwealth telecommunications policy, planning, and activities.

Summary

The critical needs statements and explanatory rationale above, which grew out of the exhaustive inventory and survey information compiled throughout the study, must be addressed with vigor and alacrity. Government, independent, and nonprofit agencies must find ways to cooperate in the utilization of telecommunications facilities to ensure that the vast potential of the technology is harnessed to the needs of the Commonwealth. The next step is to develop an action plan to satisfy these clear and unmet needs so that a coordinated telecommunications system can be developed to serve all the citizens of Pennsylvania.

APPENDIX A

Commission and Advisory Groups

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APPENDIX B

PPTN Survey Instrument

Name of Organization	Street Address
City, State, Zip	
Person Completing Questionnaire (Title)	Office Phone (include Area Code)

1. Does your organization receive, provide or exchange with State agencies the following types of information, and how would you characterize the volume of that activity?

	Provide			Receive			Exchange		
	Low (x)	Moderate (x)	Substantial (x)	Low (x)	Mod (x)	Sub (x)	Low (x)	Mod (x)	Sub (x)
Electronic Data Processing									
Records									
Statistics									
Action Advice									
Information									

2. How is this exchange conducted?	Telephone (x)	Mail (x)	Personal Contact (x)	Other (Specify) (x)
Electronic Data Processing				
Records				
Statistics				
Action Advice				
Information				

3. Does your organization receive, provide or exchange with private or community organizations the following types of information, and how would you characterize the volume of that activity?

	Provide			Receive			Exchange		
	Low (x)	Moderate (x)	Substantial (x)	Low (x)	Mod (x)	Sub (x)	Low (x)	Mod (x)	Sub (x)
Electronic Data Processing									
Records									
Statistics									
Action Advice									
Information									
Licensing/Testing									

4. How is this exchange conducted?	Telephone (x)	Mail (x)	Personal Contact (x)	Other (Specify) (x)
Electronic Data Processing				
Records				
Statistics				
Action Advice				
Information				
Licensing/Testing				

5. Does your organization receive, provide or exchange with the general public the following types of information, and how would you characterize the volume of that activity?

	Provide			Receive			Exchange		
	Low (x)	Moderate (x)	Substantial (x)	Low (x)	Mod (x)	Sub (x)	Low (x)	Mod (x)	Sub (x)
Electronic Data Processing									
Records									
Statistics									
Action Advice									
Information									
Licensing/Testing									

6. How is this exchange conducted?	Telephone (x)	Mail (x)	Personal Contact (x)	Other (Specify) (x)
Electronic Data Processing				
Records				
Statistics				
Action Advice				
Information				
Licensing/Testing				

7. Does your organization utilize television or audio in the conduct of its activity? (Use check marks in appropriate blocks.)

- ☐ Over-the-air broadcast
- ☐ Closed-circuit within headquarters
- ☐ Closed-circuit to field offices
  - ☐ Tape distribution
  - ☐ "Live" distribution
- ☐ Closed-circuit with other organizations
  - ☐ Tape distribution
  - ☐ "Live" distribution

For what purpose is this use?

- ☐ Public information
- ☐ In-service training
- ☐ Case study
- ☐ Conference
- ☐ Conduct of business
- ☐ Classroom teaching

8. Does your organization maintain dedicated circuits between: (Dedicated means part-time or full-time circuits that exist for your exclusive use.)

- ☐ Your agency headquarters and field offices
- ☐ Your agency and ☐ State ☐ County ☐ Local agencies
- ☐ Your agency and public or community institutions
- ☐ Your agency and the Federal government
- ☐ Other (Specify) _____

Please list those circuits:

- ☐ More than will fit in space provided

From	To	Type	Usage	Full or Part Time?

9. Does your organization now engage in the following type activities, and what are your future plans regarding these activities?

	Now			Future		
	Never (x)	Occasional (x)	Frequent (x)	Never (x)	Occasional (x)	Frequent (x)
Conferences						
Seminars						
Inter-agency Meetings						
Hearings or other large public meetings						

(fold)

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL

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Pennsylvania Public Television Network
169 West Chocolate Avenue
Hershey, PA 17033

APPENDIX C

Survey Respondents and Interviews

RESPONDENTS--STATE GOVERNMENT

DEPARTMENT OF COMMUNITY AFFAIRS

Harrisburg Regional Office
Bureau of Local Government Services
Northeast Region Office
Northwest Regional Office
Southeast Regional Office
Southwest Regional Office

BOARD OF PROBATION AND PAROLE

Allentown District Office
Combined Headquarters
Harrisburg District Office
Philadelphia District Office
Pittsburgh District Office
Scranton District Office
Williamsport District Office

DEPARTMENT OF LABOR AND INDUSTRY

Bureau of Professional and Occupational Affairs
Bureau of Program Support
Bureau of Labor Standards
Bureau of Mediation
Bureau of Occupational and Industrial Safety
Bureau of Workers Compensation
Office of Employment Security
Occupational Information Coordinating Committee
Workers Compensation - Data Division

OFFICE OF THE ATTORNEY GENERAL

Bureau of Drug Control
Collections - Eastern Region
Consumer Protection
Consumer Protection - Eastern Region
Consumer Protection - Western Region
Criminal Investigation - Toxic Waste
Eastern Regional Office
Office of Civil Law
Planning and Development
TIP, Pittsburgh

OFFICE OF THE AUDITOR GENERAL

- Bureau of Communications
- Bureau of Federal Audits
- Bureau of Investigations
- Bureau of Research and Planning
- TIP - Harrisburg

PENNSYLVANIA LIQUOR CONTROL BOARD

- Bureau of Enforcement, Allentown
- Bureau of Enforcement, Erie
- Bureau of Enforcement, Harrisburg
- Bureau of Enforcement, Pittsburgh
- Bureau of Enforcement, Punxsutawney
- Bureau of Licensing
- Office of the Comptroller

CIVIL SERVICE COMMISSION

- Headquarters
- Eastern Regional Office

DEPARTMENT OF PUBLIC WELFARE

- Secretary's Representative, Southeastern Region
- Secretary's Representative, Western Region
- Press and Publications Office
- Office of Federal and State Relations
- Developmental Disabilities Planning Council
- Office of Clients Rights
- Office of Income Maintenance
    - Bureau of Special Investigation
    - Bureau of Policy
    - Bureau of Quality Control
    - Northeast/Southeast Area Office
    - Western Area Office
    - Bureau of Claim Settlement
        - Dauphin Area
        - Luzerne Area
- Office of Medical Assistance
    - Bureau of Provider Relations
    - Bureau of Reimbursement Methods
    - Bureau of Utilizations Review
- Office of Mental Health
    - Bureau of Program Services

DEPARTMENT OF PUBLIC WELFARE (continued)

- Office of Mental Retardation
  - Bureau of Program Development
  - Bureau of Intermediate Care Facilities
  - Bureau of Program Management
- Office of Social Programs
  - Bureau of Adult Residential Services
    - Division of Policy and Planning
    - Division of Personal Care
- Office of Children, Youth and Families
  - Administrative Services
  - Bureau of Child and Youth Development
  - Information Systems Unit
- Deputy Secretary for Administration
  - Bureau of Facilities Management
  - Bureau of Institutional Services
  - Bureau of Systems Development

DEPARTMENT OF COMMERCE

- Bureau of Economic Assistance
- Bureau of Economic Development
- Bureau of Management and Administration
- Bureau of Travel Development
- Press Office
- Small Business Action Center

DEPARTMENT OF REVENUE

- Bureau of Accounts Settlement
- Bureau of Administrative Services
- Bureau of Data Reduction
- Bureau of Enforcement
- Bureau of Central Records
- Bureau of Field Operations
- Bureau of Fiscal Management
- Bureau of State Lotteries
  - Division of Operations
  - Region II
  - Region III
  - Region IV
- Bureau of Receipts and Control

PENNSYLVANIA CRIME COMMISSION

- Executive Office
- Northeast Region

DEPARTMENT OF TRANSPORTATION

- Bureau of Contract Quality Control
- Bureau of Highway Services
- Bureau of Motor Vehicles
- Bureau of Office Services
- Bureau of Public Transit
- Commonwealth Photographic Services
- Chief Highway Engineer
  - Engineering District 1-0
  - Engineering District 4-0
  - Engineering District 6-0
  - Engineering District 9-0
- Office of Press and Legislative Affairs

COUNCIL ON DRUG AND ALCOHOL ABUSE

- Bureau of Community Assistance
- Bureau of Community Assistance, Region III
- Bureau of Program Services

DEPARTMENT OF EDUCATION

- Bureau of Press and Communications
  - Division of Educational Media
- Office of Basic Education
  - Bureau of Curriculum Services
    - Correction Education Division
  - Bureau of Special Education
- Office of Higher Education
  - Bureau of Academic Programs
  - Bureau of Certification
- Office of Research Planning and Data Management
  - Bureau of Planning, Research and Evaluation
  - Bureau of Information Systems
- State Library of Pennsylvania
- Office of the Comptroller
  - Bureau of School Accounting and Subsidies
  - Bureau of Fiscal Control
- State-Owned Education Institutions
  - Clarion State College
  - Lock Haven State College
  - Mansfield State College

PENNSYLVANIA GAME COMMISSION

- Division of Administration

PENNSYLVANIA HIGHER EDUCATION ASSISTANCE AGENCY

HISTORIC AND MUSEUM COMMISSION

SINGLE-RESPONSE AGENCIES

Emergency Management Agency
Housing Finance Agency
Insurance Department
Medical, Professional Liability Catastrophe Loss Fund
School Employes Retirement System
State Employes Retirement System
State Horse Racing Commission
Superior Court
Supreme Court Agencies

DEPARTMENT OF AGRICULTURE

Bureau of Marketing
Chambersburg Field Office
Crop Reporting Service
Press Office
Region II Office
Region IV Office
Region V Office

COUNCIL ON DRUG & ALCOHOL ABUSE

Accounts and Statistics
Headquarters

MUNICIPAL RETIREMENT BOARD

Membership
Municipal Services

DEPARTMENT OF AGING

Central District
Northeast District
Press Office

PUBLIC UTILITY COMMISSION

Administrative Law Judges
Bureau of Non-Rail Transportation
Director of Operations

SECURITIES COMMISSION

Division of Administrative Services
Division of Licensing

DEPARTMENT OF STATE

Bureau of Administrative Services
Commission on Charitable Organizations
Corporation Bureau
Regional Office, Pittsburgh

PENNSYLVANIA STATE POLICE

Bureau of Research and Development
Bureau of Training and Education

TAX EQUALIZATION BOARD

Division of Certifications

SUPREME COURT

Southeast District

COMMISSION ON CRIME AND DELINQUENCY

Bureau of Administration
Bureau of Criminal Justice Statistics
Northwest Division Office

DEPARTMENT OF TREASURY

Bureau of Information Services
Bureau of Securities

RESPONDENTS--PUBLIC SERVICE SECTOR ORGANIZATIONS

AGRICULTURAL AND RURAL

Brandywine Conservancy
Master Farmers Association of Pennsylvania
Pennsylvania Association of Farmers Coops
Pennsylvania Environmental Council
Pennsylvania Farmers Association
Pennsylvania Agricultural Safety Council
Pennsylvania 4H Program
Pennsylvania Livestock Association
Western Pennsylvania Conservancy

HUMAN RIGHTS

American Association of Older People
Association for Retarded Citizens of Pennsylvania
Fellowship Commission
Little People of America
Mental Health Association of Pennsylvania
Pennsylvania Advisory Committee to U.S. Commission of Civil Rights
Pennsylvania Association for the Advancement of the Deaf
Pennsylvania Association for the Blind
Pennsylvania Equal Rights Council - Pittsburgh
Pennsylvania Service - Jobs for Progress
Pennsylvania Special Olympics
Pennsylvania State Council of NAACP Branches
Sheltered Employment Services
Shenango Valley Urban League

BUSINESS

Dairy and Nutrition Council
Dairy Council Inc.
Pennsylvania Food Merchants Association
Pennsylvania Newspaper Publishers Association
Pennsylvania Chamber of Commerce

EMERGENCY RESPONSE

American Red Cross - Harrisburg
American Red Cross - Pittsburgh
Pennsylvania Emergency and Communications Council

EDUCATIONAL

American Association of University Professors
Citizens for the Arts in Pennsylvania
Pennsylvania Academy of Science
Pennsylvania Association of Colleges and Universities
Pennsylvania Congress of Parents and Teachers
Pennsylvania Interscholastic Athletic Association, Inc.
Pennsylvania Science Teachers Association
Pennsylvania State Education Association
Pennsylvania Council for Social Studies

MEDICAL

American Cancer Society - Pennsylvania Division
Arthritis Foundation - Western Pennsylvania Chapter
Arthritis Foundation - Central Pennsylvania Chapter
March of Dimes
Pennsylvania Association of Rehabilitation Facilities
Pennsylvania Council on Alcohol Problems
Pennsylvania Medical Society

SOCIAL SERVICE

Church Women United
Historical Society of Pennsylvania
Keystone Area Council - Boy Scouts of America
League of Women Voters of Pennsylvania
Pennsylvania Catholic Conference
Police Athletic League
Pennsylvania Society for the Prevention of Cruelty to Animals
United Way of Pennsylvania

INTERVIEWS CONDUCTED

Association of Pennsylvania Hospitals

Berks Cable TV Corp.

Berks Community Television

Boeing Computer Services Inc.

Center for Instructional Resources

City of Pittsburgh

Community College of Allegheny County

Connecticut ETV

Governor's Office (Pennsylvania)

Governor's Special Committee on Electronic Data Processing

GTE Telenet

Hahnemann Medical College and Hospital

Health & Welfare Planning Center of Pittsburgh

Hospital Association of Pennsylvania

Hospital Council of Western Pennsylvania

Institute for Higher Education

KCET Teletext Demonstration Group

Logica Inc.

National Aeronautic and Space Administration
Industrial Applications Center

National Association of Educational Broadcasters

National Federation of Local Cable Programmers

NCR Corp.

Northern Bell Laboratories

North Carolina Agency for Public Telecommunications

Pennsylvania Association of Radio Reading Services

Pennsylvania Bell Telephone Company

Pennsylvania Cable Television Association

Pennsylvania Civil Service Commission

Pennsylvania Department of Commerce
- Bureau of Appalachian Development
- Bureau of Regional Services

Pennsylvania Department of Education
- Bureau of Press and Communications
- Educational Technologies Task Force
- Secretary

Pennsylvania Department of General Services
- Bureau of Telecommunications and Standards

Pennsylvania Department of Labor & Industry
- Bureau of Employment Security
- Job Service

Pennsylvania Department of Transportation
- Commonwealth Photographic Services

Pennsylvania Educational Communications System

Pennsylvania Emergency Management Agency/Emergency Broadcast Council

Pennsylvania Fish Commission

Pennsylvania House of Representatives
- Subcommittee on Telecommunications

Pennsylvania Legislative Data Processing Center

Pennsylvania Office of Budget and Administration

Pennsylvania School for the Deaf

Pennsylvania State Library

Pennsylvania State University
    Committee on Communications
    M. S. Hershey Medical Center
    Pennarama Programming Service

Pennsylvania United Way

Raytheon Corp.

Robert Morris College

Rogers Cable Corp.

South Carolina ETV

TV Ontario

University of Pittsburgh
    External Studies Program
    Graduate School of Public and International Affairs
    Provost's Office
    University Health Center
    Western Psychological Center

Virginia Department of Telecommunications

WITF Community Network Consortium

APPENDIX

D-1

Survey Results: Total Response

TOTAL RESPONSE

1. Does your organization receive, provide or exchange with State agencies the following types of information, and how would you characterize the volume of that activity?

Provide to State Agencies

	LOW	MODERATE	SUBSTANTIAL
Electronic D.P.	24%	6%	5%
Records	26%	20%	9%
Statistics	32%	19%	13%
Action Advice	23%	28%	14%
Information	21%	33%	24%

Receive from State Agencies

Electronic D.P.	24%	13%	7%
Records	22%	21%	9%
Statistics	26%	23%	11%
Action Advice	29%	24%	6%
Information	20%	33%	19%

Exchange with State Agencies

Electronic D.P.	23%	5%	3%
Records	26%	12%	6%
Statistics	25%	15%	5%
Action Advice	23%	18%	7%
Information	21%	28%	14%

2. How is this exchange conducted?

	TELEPHONE	MAIL	PERS. CONT.	OTHER
Electronic D.P.	12%	30%	15%	8%
Records	21%	58%	27%	4%
Statistics	34%	65%	29%	2%
Action Advice	58%	57%	54%	2%
Information	66%	81%	64%	4%

3. Does your organization receive, provide or exchange with private or community organizations the following types of information, and how would you characterize the volume of that activity?

Provide to Private or Community Organizations

	LOW	MODERATE	SUBSTANTIAL
Electronic D.P.	19%	5%	2%
Records	23%	10%	5%
Statistics	27%	15%	7%
Action Advice	24%	18%	17%
Information	21%	30%	23%
Licensing/Test.	12%	6%	9%

Receive from Private or Community Organizations

Electronic D.P.	20%	4%	2%
Records	18%	11%	6%
Statistics	26%	12%	4%
Action Advice	23%	16%	7%
Information	25%	20%	14%
Licensing/Test.	14%	4%	3%

Exchange with Private or Community Organizations

Electronic D.P.	17%	2%	1%
Records	19%	8%	3%
Statistics	20%	8%	4%
Action Advice	18%	15%	5%
Information	19%	18%	12%
Licensing/Test.	12%	5%	3%

4. How is this exchange conducted?

	TELEPHONE	MAIL	PERS. CONT.	OTHER
Electronic D.P.	10%	19%	8%	3%
Records	18%	38%	19%	0%
Statistics	28%	50%	27%	1%
Action Advice	51%	51%	49%	2%
Information	68%	73%	60%	4%
Licensing/Test.	11%	21%	17%	0%

5. Does your organization receive, provide or exchange with the general public the following types of information, and how would you characterize the volume of that activity?

Provide to the General Public

	LOW	MODERATE	SUBSTANTIAL
Electronic D.P.	14%	1%	1%
Records	17%	10%	6%
Statistics	21%	17%	10%
Action Advice	19%	12%	18%
Information	19%	29%	31%
Licensing/Test.	10%	5%	9%

Receive from the General Public

Electronic D.P.	13%	0%	0%
Records	15%	5%	4%
Statistics	18%	5%	1%
Action Advice	22%	8%	4%
Information	27%	12%	11%
Licensing/Test.	12%	3%	2%

Exchange with the General Public

Electronic D.P.	13%	0%	0%
Records	13%	4%	1%
Statistics	16%	4%	2%
Action Advice	15%	7%	4%
Information	17%	10%	10%
Licensing/Test.	12%	1%	1%

6. How is this exchange conducted?

	TELEPHONE	MAIL	PERS. CONT.	OTHER
Electronic D.P.	5%	9%	4%	0%
Records	19%	31%	18%	1%
Statistics	27%	42%	20%	3%
Action Advice	41%	43%	35%	2%
Information	65%	73%	56%	10%
Licensing/Test.	10%	16%	13%	0%

7. Does your organization utilize television or audio in the conduct of its activity?

Over-the-Air Broadcast			31%
Closed-Circuit within Headquarters			8%
Closed-Circuit to Field Offices			6%
Tape distribution	6%	OR	100%
Live distribution	0%	OR	7%
Closed-Circuit with Other Organizations			4%
Tape distribution	4%	OR	89%
Live distribution	2%	OR	44%

For what purpose is this use?

Public Information	31%
In-Service Training	9%
Case Study	0%
Conferences	3%
Conduct Business	7%
Classroom Teaching	6%

8. Does your organization maintain dedicated circuits between:

Agency Headquarters and Field Offices	15%
Own Agency and State Agencies	9%
Own Agency and County Agencies	2%
Own Agency and Local Agencies	2%
Own Agency and Public/Community Institutions	2%
Own Agency and the Federal Government	2%
Other	4%
More than will fit in space provided	3%

9. Does your organization now engage in the following type activities, and what are your future plans regarding these activities?

Current Involvement

	NEVER	OCCASIONAL	FREQUENT
Conferences	4%	64%	21%
Seminars	6%	64%	19%
Interagency Meetings	7%	50%	24%
Hearings/Large Public Meetings	18%	45%	16%

Future Involvement

Conferences	3%	58%	23%
Seminars	4%	60%	21%
Interagency Meetings	4%	47%	24%
Hearings/Large Public Meetings	14%	42%	18%

APPENDIX

D-2

Survey Results: Nonprofit and Community

NONPROFIT AND COMMUNITY

1. Does your organization receive, provide or exchange with State agencies the following types of information, and how would you characterize the volume of that activity?

Provide to State Agencies

	LOW	MODERATE	SUBSTANTIAL
Electronic D.P.	11%	0%	0%
Records	16%	7%	2%
Statistics	35%	9%	5%
Action Advice	25%	24%	9%
Information	29%	31%	13%

Receive from State Agencies

Electronic D.P.	11%	5%	0%
Records	11%	13%	4%
Statistics	18%	25%	7%
Action Advice	15%	29%	0%
Information	18%	29%	22%

Exchange with State Agencies

Electronic D.P.	9%	0%	0%
Records	5%	9%	2%
Statistics	11%	13%	5%
Action Advice	13%	22%	5%
Information	18%	22%	11%

2. How is this exchange conducted?

	TELEPHONE	MAIL	PERS. CONT.	OTHER
Electronic D.P.	2%	7%	4%	2%
Records	13%	33%	22%	2%
Statistics	27%	55%	29%	2%
Action Advice	58%	60%	62%	2%
Information	65%	82%	71%	5%

3. Does your organization receive, provide or exchange with private or community organizations the following types of information, and how would you characterize the volume of that activity?

Provide to Private or Community Organizations

	LOW	MODERATE	SUBSTANTIAL
Electronic D.P.	5%	0%	0%
Records	11%	7%	4%
Statistics	22%	15%	4%
Action Advice	20%	29%	18%
Information	24%	31%	29%
Licensing/Test.	5%	4%	2%

Receive from Private or Community Organizations

Electronic D.P.	7%	2%	0%
Records	7%	7%	2%
Statistics	22%	13%	2%
Action Advice	18%	27%	7%
Information	29%	18%	20%
Licensing/Test.	4%	4%	0%

Exchange with Private or Community Organizations

Electronic D.P.	5%	2%	0%
Records	4%	7%	5%
Statistics	13%	7%	7%
Action Advice	9%	22%	11%
Information	13%	20%	16%
Licensing/Test.	4%	5%	4%

4. How is this exchange conducted?

	TELEPHONE	MAIL	PERS. CONT.	OTHER
Electronic D.P.	2%	5%	4%	0%
Records	11%	25%	9%	0%
Statistics	22%	45%	29%	2%
Action Advice	65%	64%	64%	2%
Information	75%	89%	71%	5%
Licensing/Test.	2%	11%	11%	0%

5. Does your organization receive, provide or exchange with the general public the following types of information, and how would you characterize the volume of that activity?

Provide to the General Public

	LOW	MODERATE	SUBSTANTIAL
Electronic D.P.	4%	0%	0%
Records	5%	5%	9%
Statistics	13%	11%	13%
Action Advice	15%	15%	16%
Information	16%	35%	31%
Licensing/Test.	0%	4%	4%

Rèceive from the General Public

Electronic D.P.	2%	0%	0%
Records	0%	7%	4%
Statistics	5%	11%	2%
Action Advice	7%	13%	5%
Information	20%	13%	7%
Licensing/Test.	0%	0%	0%

Exchange with the General Public

Electronic D.P.	4%	0%	0%
Records	0%	7%	2%
Statistics	4%	11%	4%
Action Advice	2%	7%	7%
Information	5%	13%	9%
Licensing/Test.	0%	4%	0%

6. How is this exchange conducted?

	TELEPHONE	MAIL	PERS. CONT.	OTHER
Electronic D.P.	2%	2%	0%	2%
Records	13%	16%	13%	4%
Statistics	24%	33%	20%	5%
Action Advice	42%	45%	36%	7%
Information	56%	71%	47%	22%
Licensing/Test.	2%	2%	7%	2%

7. Does your organization utilize television or audio in the conduct of its activity?

Over-the-Air Broadcast			51%
Closed-Circuit within Headquarters			5%
Closed-Circuit to Field Offices			2%
Tape distribution	2%	OR	100%
Live distribution	0%	OR	0%
Closed-Circuit with Other Organizations			4%
Tape distribution	4%	OR	100%
Live distribution	0%	OR	0%

For what purpose is this use?

Public Information	51%
In-Service Training	7%
Case Study	0%
Conferences	2%
Conduct Business	2%
Classroom Teaching	7%

8. Does your organization maintain dedicated circuits between:

Agency Headquarters and Field Offices	7%
Own Agency and State Agencies	7%
Own Agency and County Agencies	5%
Own Agency and Local Agencies	5%
Own Agency and Public/Community Institutions	5%
Own Agency and the Federal Government	2%
Other	9%
More than will fit in space provided	2%

9. Does your organization now engage in the following type activities, and what are your future plans regarding these activities?

Current Involvement

	NEVER	OCCASIONAL	FREQUENT
Conferences	5%	47%	36%
Seminars	7%	44%	35%
Interagency Meetings	15%	18%	40%
Hearings/Large Public Meetings	16%	49%	13%

Future Involvement

Conferences	4%	45%	42%
Seminars	4%	44%	40%
Interagency Meetings	11%	22%	38%
Hearings/Large Public Meetings	15%	45%	15%

APPENDIX

D-3

Survey Results: Government Agencies

GOVERNMENT AGENCIES

1. Does your organization receive, provide or exchange with State agencies the following types of information, and how would you characterize the volume of that activity?

Provide to State Agencies

	LOW	MODERATE	SUBSTANTIAL
Electronic D.P.	27%	8%	62%
Records	28%	23%	11%
Statistics	31%	21%	15%
Action Advice	22%	28%	15%
Information	18%	32%	27%

Receive from State Agencies

Electronic D.P.	28%	41%	31%
Records	24%	23%	10%
Statistics	27%	21%	11%
Action Advice	38%	22%	7%
Information	20%	33%	18%

Exchange with State Agencies

Electronic D.P.	26%	68%	4%
Records	31%	13%	7%
Statistics	29%	16%	5%
Action Advice	25%	16%	7%
Information	21%	29%	14%

2. How is this exchange conducted?

	TELEPHONE	MAIL	PERS. CONT.	OTHER
Electronic D.P.	15%	36%	17%	10%
Records	23%	64%	28%	4%
Statistics	34%	66%	27%	2%
Action Advice	55%	54%	50%	2%
Information	64%	78%	59%	44%

3. Does your organization receive, provide or exchange with private or community organizations the following types of information, and how would you characterize the volume of that activity?

Provide to Private or Community Organizations

	LOW	MODERATE	SUBSTANTIAL
Electronic D.P.	23%	62%	3%
Records	25%	10%	5%
Statistics	28%	15%	8%
Action Advice	24%	14%	16%
Information	19%	29%	20%
Licensing/Test.	14%	7%	11%

Receive from Private or Community Organizations

Electronic D.P.	23%	5%	2%
Records	21%	12%	7%
Statistics	26%	11%	5%
Action Advice	28%	12%	5%
Information	23%	20%	12%
Licensing/Test.	17%	5%	3%

Exchange with Private or Community Organizations

Electronic D.P.	20%	2%	1%
Records	23%	8%	2%
Statistics	21%	88%	3%
Action Advice	20%	6%	3%
Information	20%	16%	10%
Licensing/Test.	14%	5%	2%

4. How is this exchange conducted?

	TELEPHONE	MAIL	PERS. CONT.	OTHER
Electronic D.P.	12%	23%	9%	4%
Records	19%	41%	21%	1%
Statistics	29%	50%	25%	1%
Action Advice	45%	46%	42%	2%
Information	63%	65%	54%	2%
Licensing/Test.	13%	23%	18%	1%

5. Does your organization receive, provide or exchange with the general public the following types of information, and how would you characterize the volume of that activity?

Provide to the General Public

	LOW	MODERATE	SUBSTANTIAL
Electronic D.P.	16%	1%	2%
Records	20%	11%	5%
Statistics	22%	19%	8%
Action Advice	19%	10%	18%
Information	19%	26%	29%
Licensing/Test.	12%	6%	10%

Receive from the General Public

Electronic D.P.	16%	0%	0%
Records	20%	4%	4%
Statistics	21%	3%	1%
Action Advice	25%	6%	4%
Information	28%	11%	11%
Licensing/Test.	15%	2%	2%

Exchange with the General Public

Electronic D.P.	15%	0%	0%
Records	16%	2%	1%
Statistics	19%	2%	2%
Action Advice	19%	6%	3%
Information	20%	9%	10%
Licensing/Test.	15%	0%	2%

6. How is this exchange conducted?

	TELEPHONE	MAIL	PERS. CONT.	OTHER
Electronic D.P.	6%	11%	5%	0%
Records	20%	34%	19%	1%
Statistics	27%	44%	20%	2%
Action Advice	40%	41%	34%	1%
Information	66%	71%	56%	5%
Licensing/Test.	12%	20%	14%	0%

7. Does your organization utilize television or audio in the conduct of its activity?

Over-the-Air Broadcast			24%
Closed-Circuit within Headquarters			8%
Closed-Circuit to Field Offices			7%
Tape distribution	7%	OR	100%
Live distribution	1%	OR	8%
Closed-Circuit with Other Organizations			4%
Tape distribution	3%	OR	100%
Live distribution	2%	OR	60%

For what purpose is this use?

Public Information	23%
In-Service Training	8%
Case Study	1%
Conferences	3%
Conduct Business	8%
Classroom Teaching	6%

8. Does your organization maintain dedicated circuits between:

Agency Headquarters and Field Offices	17%
Own Agency and State Agencies	10%
Own Agency and County Agencies	1%
Own Agency and Local Agencies	1%
Own Agency and Public/Community Institutions	1%
Own Agency and the Federal Government	2%
Other	3%
More than will fit in space provided	3%

9. Does your organization now engage in the following type activities, and what are your future plans regarding these activities?

Current Involvement

	NEVER	OCCASIONAL	FREQUENT
Conferences	44%	67%	16%
Seminars	5%	68%	13%
Interagency Meetings	4%	59%	19%
Hearings/Large Public Meetings	18%	42%	17%

Future Involvement

Conferences	3%	60%	16%
Seminars	3%	63%	14%
Interagency Meetings	2%	54%	19%
Hearings/Large Public Meetings	14%	40%	19%

APPENDIX E

PSSC Report and Analysis

A REPORT ON

SHARING AND AUGMENTED SERVICE POTENTIALS

FOR

COMMONWEALTH OF PENNSYLVANIA

PUBLIC TELECOMMUNICATIONS NETWORKS

Prepared for the
Pennsylvania Public Television Network Commission
169 Chocolate Avenue
Hershey, Pennsylvania

by the:

Public Service Satellite Consortium
2480 West 26th Avenue, Suite 90-B
Denver, Colorado 80211

March 1982

TABLE OF CONTENTS

		Page
I.	INTRODUCTION	108
II.	SUMMARY DESCRIPTION OF QUESTIONNAIRE RESULTS	111
	Background	
	Organization Breakdown	
	Data Type Breakdown	
	Data Flow Breakdown	
	Mode of Interaction	
	Utilization of TV or Audio	
	Dedicated Circuit Inventory	
	Meeting-Oriented Activities	
	Geographic Breakdown	
III.	TELECOMMUNICATIONS AND NETWORKING PRINCIPLES	120
	Networks and Aggregation - Definitions	
	Basic Facts	
	Types of Information	
	Video Trnasmissions	
	Audio Transmission	
	Data Transmission	
	Traffic Intensity and Economies of Delivery	
IV.	THE NATURE OF AGGREGATION - THE DRIVING FORCES	129
	User Requirements	
	User Options for Service	
	Planning Constraints	
	Gathering Specific Network Needs Data	
	Traffic-Base Data	
	Data Gathering	
	Planner/User Communication	
	Service is for User Benefit	
	Next Steps	
	Anything Worth Doing	

TABLE OF CONTENTS
continued

		Page
V.	TRAFFIC SUFFICIENCY - A NECESSARY CONDITION	137
	Sufficiency vs. Delay	
	Sufficiency vs. Geography	
	Sufficiency vs. Economics and Alternatives	
	Economic Sufficiency for Leased Service	
VI.	TELECOMMUNICATIONS MANAGEMENT - A MODEL FOR ADMINISTRATION	141
VII.	INNOVATIVE SERVICES - NO NEED TO WAIT	145
	Proceed to Implement, but Plan Carefully	
	Getting Started with a Technical Barrier	
	Going Too Far	
	Keeping Current	
	Telecommunications Facilities vs. User Facilities	
VIII.	TELECOMMUNICATIONS ACTIVITIES - POSSIBILITIES	149
	Teleconferencing	
	Meeting Configurations	
	Point-to-Multipoint	
	Point-to-Point and Multipoint-to-Multipoint	
	Meeting Formats	
	Two-way Video/Two-way Audio	
	One-way Video/Two-way Audio	
	Video Teleconferencing	
	General Description	
	Video Teleconferencing and State Agencies	
	Advantages of Video Teleconferencing	
	When a Conference Call is Not Enough	
	Audio Teleconferencing	
	Permanent and Portable Conference Room Systems	
	Meet-Me Bridges	
	Videotex and Teletext	
	Computer Conferencing	
	Closed Captioning Services	
	Harrisburg Department of Education Link	

TABLE OF CONTENTS
continued

VIII.

Hahnemann Linkage

Pennarama System

Berks Community Television

Community Access Centers

Opportunities Unlimited

I. INTRODUCTION

Agencies and organizations in the Commonwealth of Pennsylvania have been quite active through the years in developing telecommunication systems for more efficient operations. As such telecommunication systems in the state developed and operations became more efficient and cost effective, it became increasingly apparent to the PPTN Commission that the Commonwealth of Pennsylvania had several extremely valuable resources to take advantage of. In order to assess what telecommunications systems might be made available and to explore potential service applications to meet the needs of Pennsylvania citizens, the governor of Pennsylvania appointed PPTN as the lead agency to conduct a study which included an inventory and exploration of potential service applications.

The Commonwealth of Pennsylvania does indeed have a tremendous investment in telecommunications systems of all kinds. Many agencies have invested large sums of capital in such systems to allow them to perform their functions smoothly and efficiently. As needs grow for public services in any municipal, state, or federal organization, it becomes logical to take advantage of savings in time as well as increases in productivity and even message penetration by employing telecommunications.

We in the United States have been accurately labeled as an Information Society. The phenomenon of our becoming an Information Society,

however, is not related as much to our culture or our heritage as it is related to our basic human nature. Any nation, given the technological and political means to have "information" available at their fingertips, will become an Information Society. The social need is built in. The technology is merely a catalyst -- a facilitator to effect means of satisfying mankind's voracious appetite for information of all kinds.

But, you may ask, how does this relate to the Commonwealth of Pennsylvania and the issues at hand? The answer is primarily one of "technological timing". In other words, social needs lead technology, but technology leads telecommunications solutions. A case in point supporting this is found in the community antenna television industry (cable TV). The latent need for "more or better television viewing" than was (and even still is) available to the public, has remained latent until the advent of appropriate technology (first the television set, then the delivery system (the cable), and now the satellite). The first investments in television technology did not await an ultimate system. The needs were there. The development of applications followed.

There is a similar trend of development in Pennsylvania in terms of telecommunications. Systems have been put in place to satisfy immediate to long range social needs. Since the "ultimate telecommunications system" will be forever in development, there is no sense in, nor need to wait for further implementation, nor to delay using what is already in place. The key is to always look ahead to plan for "efficient" development, modification, and upgrade of those

existing systems now serving the needs of the Commonwealth of Pennsylvania.

The key to effective planning is to maintain a clear understanding of the constraints impinging upon the planning process. These can be generally classified as: 1) Social, 2) Political, 3) Economic, and 4) Technological constraints. They are listed in their order of general importance, but any of them, assessed incorrectly, can nullify the best of planning in all the others.

This report is meant to primarily address those general technological constraints which must be recognized and effectively dealt with in developing Pennsylvania's telecommunications infrastructure from what it currently consists of to what it might be adapted to become. The first section of the report is a general assessment of a survey conducted by the PPTN to examine the communication needs of state and non-profit organizations in the Commonwealth. In addition, and toward the end of the report, a number of services which could be implemented relatively easily are proposed which would greatly enhance the capability of PPTN and other state telecommunications networks to better serve both the state agency and non-profit sectors. Interest shown by the respondents in these two categories in answering the above mentioned questionnaire reinforce the hypothesis that great social needs exist, and solutions are desired.

II. SUMMARY DESCRIPTION OF QUESTIONNAIRE RESULTS

Background

The following narrative is based on a review of the results of a survey designed and disseminated by the Pennsylvania Public Television Network. The actual questionnaire is presented in the appendix portion of this report. The first sections of the questionnaire were developed to assess the existing data traffic activities of both state agencies and non-profit organizations in the Commonwealth of Pennsylvania. The types of data provided, received, and exchanged among these organizations were divided into the categories of Electronic Data Processing, Records, Statistics, Action Advice, Information, and Licensing/Testing (where applicable). The delivery modes were identified as telephone, mail, personal contact, and "other" (as specified by respondents). Respondents were queried as to the volume of data their organizations provided, received or exchanged with state agencies, private or community organizations, and with the general public.

The second component of the questionnaire was designed to inventory those organizations which use television or audio for various purposes, including closed-circuit applications, to communicate with headquarters, field offices, or other organizations. Question #8 assesses those organizations which maintain dedicated circuits internally or with other organizations.

The last question examines the frequency of a respondent's organization in conducting various types of meeting-oriented activities both in the present, as well as in the future. The rationale behind this assessment was primarily to gauge the volume of meeting activities which might potentially lend themselves to teleconferencing applications.

The overall objective of this survey was to make a general assessment of how information currently flows among state and non-profit organizations in the state, as well as the volume and mode of delivery of such communications. Thus, questionnaire results should be viewed as an interim tool in identifying organizations with telecommunication resources with which to pursue further communications, or to identify future tasks to be executed so that appropriate and sufficient data can be collected.

The following describes some of the highlights of questionnaire results. Outcomes of the various questions were examined in terms of:

- -Organization Breakdown: traffic and data patterns of state agencies, private/community organizations, and the general public.
- -Data Type Breakdown: Volume of "Information", "Action Advice", "Records", "Statistics", and "Electronic Data Processing" among the above organization categories.
- -Data Flow Breakdown: The provision, reception, and exchange of data among organizational categories.
- -Mode of Interaction: How data is most commonly delivered: via "Mail", "Telephone", "Personal Contact", or "Other" (as specified by respondents).
- -Utilization of TV or Audio by a respondent's organization.
- -Dedicated circuit inventory of organizations in Pennsylvania.

-Teleconference potentials.

-Geographic Breakdown: Emphasis on densely populated areas of Pennsylvania.

Organization Breakdown

In comparing interaction activities of state agencies, private or community organizations, and the general public, there was little variation in terms of the direction of information flow. The volume of various data types and modes of delivery of each data type also had little variation.

The provision, reception or exchange of data among all three organizational categories indicate that more data is provided to them, followed by data reception and exchange, respectively. The volume of the various data types was also consistent in all three categories. "Information" as a data type, had by far the greatest volume of all data types specified. "Information" accounted for 33% of all data interaction with state agencies, 35% of the interaction with private or community organizations, and 41% of the interaction with the general public. Volume for "Action advice" ranked second, followed by "Statistics", "Records", "Licensing/Testing" (where applicable), and "Electronic Data Processing", in all three organizational categories.

"Mail" was considered to be the most common mode of data delivery by a vast majority of the respondents within each organization category. The second most common delivery mode was via telephone, followed by "Personal Contact" and "Other" (as specified by respondents).

Data Type Breakdown

As mentioned in the previous section, "Information" was by far the most common data type. Of all the transactions where "Information" was indicated as the data type involved, 41% of this total was for interactions with state agencies. Of all "Action advice", which ranked second in volume of activity, 43% of the total of this data type were for state agency interaction. Volume of interaction with state agencies ranked highest in all data type categories, especially with electronic data processing (with 68% of the total) and statistics (encompassing 57% of the total statistic activity).

"Action Advice" was the most common form of data for interaction with private or community organizations, while "Information" and "Statistics" ranked the highest in volume for interaction with the general public.

Data Flow Breakdown

The provision of data was by far the most common form of interaction, followed by the reception and exchange of data respectively. Providing data appears to be an activity which all three organizational categories use with the same frequency, since the total for provision of data was fairly evenly split among all three groups.

Again, the most noteworthy statistics were those dealing with state agencies. Of the total activities where data reception was involved,

52% were receiving data from state agencies. Where the exchange of data was involved, 47% of this total was exchanging data with state agencies.

Mode of Interaction

As mentioned earlier, "Mail" was the most common mode of delivery by a large margin. "Telephone", ranked second, and third-ranking "Personal Contact", were closer in terms of overall totals.

Regardless of the type of data being delivered, "Mail" was the most common means of delivering data. The lowest that the "mail" category ranked was in the area of "Action advice" which still provided for 34% of all action advice activities, and was tied for highest ranking in terms of modes of distributing action advice. Interaction related to "Records" accounted for mail being used 50% of the time, and 48% of the time for statistics.

"Telephone" as a mode of interaction had the highest volume in the area of Action Advice (tied with mail). Volume of telephone interaction ranked second in all data type categories except for "Licensing/Testing" data and "Records", where "Personal Contact" ranked higher as a means of delivering data.

Utilization of TV or Audio

The most common utilization of TV or audio appears to be over-the-air broadcast mode, with 31% of the respondents indicating this as an

activity within their organization. Follow-up telephone interviews with various respondents revealed that the primary over-the-air application was in providing Public Service Announcements. Of those respondents indicating that closed-circuit TV or audio is utilized, the primary delivery mode was via taped materials as opposed to "live" delivery. The majority indicated that the primary purpose of their utilizing TV or audio was to deliver "Public Information" (31%). "In-service training" ranked a distant second (9%) and "Conducting Business" ranked third.

Dedicated Circuit Inventory

Thirty-one percent of all respondents indicated that their organizations maintained dedicated circuits, with approximately 50% of these circuits being between a given agency's headquarters and field offices. Thirty percent of those with dedicated circuits maintained them between a respondent's own agency and state agencies.

The second part of the question dealing with dedicated circuits asked respondents to list those circuits and indicate their locations. Unfortunately most respondents did not indicate geographically where their circuits are located. (For example, many indicated that circuits are maintained between the "main office and branch offices" without indicating where in the state these offices were.) Therefore, few specific conclusions regarding the geographics of these dedicated circuits can be derived at this time. The same comment applies to the type of circuits maintained, since few respondents provided specific information about their circuits.

Meeting-oriented activities

For this question, respondents were requested to estimate the volume of activity in regard to meeting-oriented activities of their organization, both presently and in the future. Tabulations and results of this question were viewed for potential teleconferencing applications.

Teleconferencing, regardless of the type, lends itself better to certain types of meetings, in terms of duration, configuration of meeting participants, and subject matter, among others. The types of meetings specified in the questionnaire were "Conferences", "Seminars", "Inter-agency Meetings" and "Hearings/other large public meetings". It should be noted that the type of meeting to be conducted in teleconference mode is an important consideration in determining hardware needs.

It must also be kept in mind that as organizations in general become increasingly aware of teleconferencing and its potential applications, the "need" for teleconference services may increase as well. The concept of "who needed a telephone before it was invented" readily applies to teleconferencing as well.

Among the types of meetings specified in the questionnaire, "Conferences", "Seminars" and "Interagency Meetings" were fairly evenly split with "Hearings/Public Meetings" being the least frequently used form of meeting. "Occasional" use was by far the most

common response to frequency of meeting activities. In terms of both types of meetings and frequency of use, there was very little difference between current and projected meeting requirements of the organizations responding.

Geographic Breakdown

Response rates of the questionnaire are quite high with almost every one of the state agencies responding, and 68% (55 out of 81 mailed) of the non-profit organizations responding.

Two interesting statistics generated by questionnaire tabulations are that 1) in taking the three heavily populated areas in the state, (Harrisburg, Pittsburgh, Philadelphia), 63% of the non-profit organizations, and 2) 88% of the state agencies responding to the questionnaire are located in these cities, (assuming that mailing addresses actually represent the locations where an organization's potential users are located). Heaviest concentration is in the city of Harrisburg, presumably due to the fact that most state agencies are located at the state capitol.

Again, Harrisburg proved to be the area where the majority (55%) of the respondents indicated that their organizations maintained dedicated circuits from their agency to field offices or other organizations. The same is true of those using closed circuit audio or television, with organizations in Harrisburg accounting for 63% of the total volume of closed-circuit activities.

Harrisburg, Pittsburgh, and Philadelphia were also selected for comparison purposes because all three cities are on or near nodes of the state microwave "backbone" system. While Pittsburgh and Philadelphia are not connected directly on the backbone system, by adding two state-owned spur links such interconnection to the system could be achieved.

III. TELECOMMUNICATIONS AND NETWORKING PRINCIPLES

Networks and Aggregation - Definitions

The essence of providing telecommunications services to the satisfaction of users, is ultimately enabling them at their own given place and time to communicate with other users at their places within times appropriate to the message or information to be communicated. Place and time are fundamental.

Since most users spend significant time at a few certain places, the chances of communicating with their place at any given time through telecommunications are enhanced by the ability to focus on the places where users are most likely to be, (e.g. "at home" or "at the office").

Places where telecommunications users can originate or receive messages over telecommunications systems are known in common telecommunications vernacular as "nodes". The (electronic) paths over which messages pass among nodes are generally called "links", "channels", or "circuits". A telecommunications system consisting of nodes interconnected by links is known as a "network". There is no implication here as to the number of links and nodes it takes to form a network, but the more numerous they are, the more complicated it becomes to interconnect them.

Assuming a large number of nodes or users is the case, several general principles apply to the handling of messages or programming on the network. One of the principles is that most nodes are not originating or receiving messages or programming all at one time. Therefore, sharing of interconnecting links becomes feasible. Throughout this section, the word "aggregation" is used frequently. Aggregation is used to describe the process of sharing links, networks, systems, or other telecommunications facilities, for the purpose of increasing utilization, cutting per use costs, or both.

Basic Facts

Several intrinsic telecommunications facts must be accounted for in developing networks. A few of the most important are describable as follows:

1) Telecommunications is either one-way or two-way. One-way communications may be typified by a broadcasting system. Almost all other applications use two-way communications. This one-way/two-way concept may seem trivial until one realizes that there is a tremendous aggregate investment in systems dedicated to providing only video (broadband) signals, and in only one direction. (Note here, however, that the Pennsylvania Public Television Network has two-way interconnectivity -- a very flexible capability.)

2) Telecommunications is either point-to-point, or point-to-multipoint. That is to say, the information passed along at any given instant is meant for one receptor, (point-to-point) or for many receptors, (point-to-multipoint).

3) Some messages can tolerate time delays, others cannot. Those which can tolerate delays have a less severe impact on the maximum capacity requirement of a network, than those which cannot tolerate delays. This is due to the next fact.

4) Message creation and delivery into a network is not constant with time. This is largely because of daily work routines. Statistically, there is one period (an hour) of the day when traffic intensity (messages within this hour) are at a maximum. The traffic handling capability of a network must be large enough to handle this busy hour intensity. Messages which can tolerate delays can be sent during times when the non-delayable traffic is not as intense. If such messages are delayed, total network utilization, and therefore efficiency, increases through higher average channel usage.

5) Very few networks can economically or practically justify dedicated information channels between each node (user location) and every other node. Such a dedicated network is feasible only for: a - a small number of nodes whose messages can b - tolerate no delay, or which c -

never need to talk to any other population of users, or d - have an unusual or non-compatible signal format compared to other users.

6) Sparse geographic dispersion of network nodes will generally cost much more to interconnect than networks with dense geographic dispersion.

7) Telecommunications networks should always be planned for expansibility, since applications or usage of facilities always follows availability of service. There are practical and economic limits to expansibility, but the systems built to handle current traffic are almost always overloaded immediately.

Types of Information

There are essentially three basic types of information channels:

- Video (having various frame rates and picture resolutions)
- Audio (including voice and compatible services)
- Data (including inter-machine communication)

Video Transmissions

The telecommunications industry has set standards on signal format, bandwidth (or the amount of information which can be carried at one time -- analogous to the size of a pipeline), and ways of both mixing and separating signals in a network to optimize flexibility by creating compatible interconnections. Perhaps the most rigid

standard, in terms of compatibility today, is in full-motion video, (standard U.S. television).

Video signals used in standard television sets take up the same bandwidth (again, the size of the pipe) as about one thousand standard telephone channels. This fact is exceedingly important, because bandwidth is generally at a premium. Video applications are usually sent one-way in a network, whereas voice and/or data between the same two network nodes will almost always require transmission in both directions. However, PPTN has the interconnection capability of transmitting video quality communications bidirectionally, thereby allowing for live interactive video. This is a valuable resource for any broadcast network.

It is important to realize that if communications channels between nodes can be economically justified based upon wide bandwidth signals alone, (e.g. standard television signals), much of the traffic which comes in smaller "packages ", such as audio or data channels, can be added to the system at a greatly reduced per-channel cost. For example, if a microwave system is built for video, there may be significant "pre-investment" costs already absorbed in buildings, foundations, towers, antennas and waveguide, power, and other infrastructure, which make it much less costly to add audio and data transmission equipment over the same routes.

Other systems can be specially built to carry these narrower band signals. The PPTN network is an example of this. It is currently equipped to carry in two directions one video signal, three

broadcast-quality audio channels, several voice-grade audio channels, a narrowband data channel and a system fault alarm and control channel. It is conceivable that significant public radio programming could therefore be distributed or exchanged, with very little additional capital outlay, over the existing PPTN system. And there is the potential to increase the number of broadcast-quality audio channels from three to six by replacing one of the three with a Public Broadcasting Service (PBS) - compatible Digital Audio Television Equipment (DATE) package at each PPTN node. Currently, most of the Pennsylvania public television stations already have DATE receivers. Much of the required investment is, therefore, already in place, requiring merely the decision to use this latent capacity. Some or perhaps most video systems allow insertion of audio or data signals into the video signal itself for almost a "free" ride. A reasonable analogy is this: A large pipe can carry a small percentage more fluid without pipeline design changes. So it is with video bandwidth channels being able to carry a small percentage more information without transmission system design changes.

Audio Transmission

Audio channels are usually thought of as those which can be heard. This represents audio frequencies between 20 Hertz (twenty cycles per second or 20 Hz) to about 20,000 Hertz (abbreviated 20 kHz). Intelligible sounds such as voices, can be fit into a much narrower range, however. Telephone receivers, for instance, have a range of about 300 Hz to 3000 Hz. In other words, the low tones below 300 Hz, and the higher tones above 3000 Hz are removed without sacrificing

voice intelligibility. The telephone is therefore not a "high fidelity" device, but it is a "high intelligibility" device. The major historic reason for dropping the fidelity reproduction of a telephone was primarily economic. More individual channels could be placed into a multiple channel transmission system (pipeline) or network. The per-channel cost therefore dropped, and more customers could be served with the installed facilities when the demand for service exceeded "a few" multiple users.

Let us not lose sight of the advantages of "high fidelity" circuits, however. Those which cover the full range of human hearing, contribute significantly to the "naturalness" of the sound. This is particularly helpful, for example, in making teleconferencing more effective. The more natural the sound, the less the participants realize that the meeting is not face-to-face. And as mentioned before, several two-way high fidelity channels are built into the PPTN network and the potential to economically add more.

Putting many messages onto the same (but wider bandwidth) channel is known as "multiplexing". Allowing many users to share a channel, but at different times and between different nodes, is most frequently known as "switching". Multiplexing and switching are the essence of "aggregation", that is, the sharing of common transmission facilities.

Data Transmission

In data communications systems, there is usually a different sort of multiplexing going on if there are multiple messages being sent over a

communications channel at one time. The multiplexing scheme is time division multiplexing. For example, if eight machines share a channel at one time, each machine will interpret (or use) only every eighth bit, ignoring the other seven intervening bits. The other seven machines "interpret" the other seven bits individually, in turn. ("Bit" is a contracted word for "binary digit". A bit can have only one of two values, often designated a one or a zero.) If a very large number of identical data machines are operating simultaneously into a single channel, the number of bits per second that that channel must be able to carry will be somewhat greater than the number of machines times the number of bits per second each is transmitting. Additionally, the higher the bit rate must be on this shared channel, the larger the bandwidth (size of the pipe) must be, and therefore the channel cost will usually be higher. Yet the cost for data transmission per machine, (through multiplexing (or aggregation)), will be lower than the cost for equivalent individual channels.

Traffic Intensity and Economies of Delivery

Traffic over a network is usually generated by people, ultimately, whether the traffic is video, audio, or data. It can therefore be safely assumed that telecommunications network investment has its greatest returns when the population density is relatively high per unit area. But there are definite geographic factors at work. To illustrate this, if we assume that people or machines in Philadelphia only needed to talk to other people or machines in Philadelphia, the cost of providing this service would be low indeed through high usage, short distance "aggregated" (multiplexed and switched) networks. But

this assumption is not realistic. Other cities and towns must communicate with Philadelphia. The required networks to serve both the users in densely populated regions as well as those in sparsely populated regions have widely divergent "aggregation economies".

IV. THE NATURE OF AGGREGATION - THE DRIVING FORCES

User Requirements

The aggregation (or sharing) of telecommunication facilities and resources is an important component in developing a user shared system. Because the primary purposes of aggregating is to cut per-use costs and/or increase system utilization the factors which make aggregation possible are all user driven. The users are the ones who have requirements for telecommunications systems. The key to creating a firm and useful plan is getting user "needs" data (guiding responses into a uniform format), creating potential network models, analyzing each model against all goals, and involving the users in the results of the modeling process. The key to creating and maintaining useful networks is to continually satisfy the user needs.

User Options for Service

It must be recognized that almost without exception, the users can survive without aggregation of telecommunications resources by any given entity. They can, and when necessary do, go to common carriers or to other suppliers, and share the common carrier's resources with other customers.

Sharing of economical Pennsylvania state networks might appear to some potential users to be less immediate than it actually is or could be. Education and demonstration that state networks can meet their needs

is a must. System planners must, therefore, provide substance, assurance, and involvement to be successful in the state agency/non-profit aggregation process.

Planning Constraints

In furnishing public telecommunications services, the full spectrum of social, political, economic, and technological factors come to the forefront. State government is bound by its citizenry to provide social services responsive to them. Political forces allocate resources into those services they judge most appropriate and advantageous. Economic constraints often limit the amount of capital investments deemed necessary to provide the best network additions, replacements, upgrades, and creation of new capabilities. At the same time, technological advancements in telecommunications systems promise both higher flexibility and better efficiency if we can wait.

But despite these divergent factors, telecommunications planning experts can derive the best fit of economics and technology to the social and political arena if they are willing to gain user-based insight and work hard toward getting in touch with them.

Gathering Specific Network Needs Data

One of the activities which PPTN recently undertook was to design and disseminate a questionnaire to make a preliminary assessment of existing telecommunications capabilities and data traffic of both state agencies and non-profit organizations, as well as their

potential needs for participating in or employing teleconference-style meetings. Questionnaire results should help to build a foundation upon which to develop future data gathering tools for obtaining more specific and comprehensive data. It is at that point when more firm decisions can be made in terms of developing a communications system which is the most cost efficient and best fit the needs of citizens in the Commonwealth. The following is a brief treatise on some of the primary considerations and components which need to be addressed in gathering the follow-on data required for such decision making processes.

Traffic-Base Data

The first part of the assignment is to accurately describe all network nodes in terms of their internodal traffic. This takes on many dimensions, not the least of which is timing -- near term needs versus intermediate and long-term needs. The type of service desired by the user (video, audio, data); the frequency, time of occurance, and duration of the messages or programming; the locations (nodes) with which current and future interaction is required; the tolerability of various lengths of delays for each type of service; the current expenditures for various services; and last but not least, the latest date after which the user will plan to arrange for his own services in lieu of being "aggregated".

Data Gathering

Such information can usually be gathered in the form of a comprehensive questionnaire. The value of the responses to the questionnaire, and the amount of thought put into them by the potential user, are usually directly related to 1) the respondent's perception of his ability to actually receive better, less costly service as a result, 2) his degree of insight and understanding of his own operations and what they might realistically be like in five years, and 3) his faith in the confidentiality of the data provided. On the other hand, questionnaire responses are usually inversely related to 1) the potential user's sense of autonomy or independence, or possibly 2) his small magnitude of telecommunications expenditures with respect to his total fiscal budget.

Planner/User Communication

Intrinsic in the success of the data gathering phase is the creation of common understanding among the respondents concerning what is being asked. The respondents should be given, with the questionnaire, insight into the ultimate goal of the aggregation process, a menu or scenario of ideas which could be realized if an aggregated network could be created. Many potential applications go unrecognized for lack of specific ideas -- applications of new and possibly unfamiliar ideas which could significantly assist user operations, but which they have never considered.

Other forms of user education are best left for follow-up visits to potential aggregated users. These are related to dialogue between planners and users, assuring that the user understands what the proposals and their possibilities are. Materials sent with the questionnaire must not be all-explanatory, since they would deter responses because of sheer volume. Equally important is planner education -- providing the assurance that system planners know the operational needs of the users, first-hand.

Service is for User Benefit

To summarize, the driving forces in aggregating diverse telecommunications needs will be those which the users determine. They will "aggregate" if it is clearly to their benefit, individually, to do so. The task is to demonstrate clear benefits to them.

Pennsylvania has significant investment in telecommunications infrastructure which begs development of latent applications which are not currently fully exploited. Further modest investment in new and old technologies can spur the realization of cost-efficient and time-saving communications methods.

Next Steps

We recommend that a deliberate effort be undertaken in the largest population areas, (population by state agency and non-profit geographic distribution -- Harrisburg, Philadelphia, and Pittsburgh), to do the following:

1. Conduct preliminary face-to-face interviews with a small select group of respondents to the questionnaire. Conduct these meetings armed with descriptions of potential service offering scenarios. Get feedback on the most and least popular services desired by this group. Create for these sessions a draft of a comprehensive user needs questionnaire which flushes out information concerning 1) the agency's demographics, to derive their internodal traffic potential (including potential message delay), 2) their estimates of how they would or could use certain types of communications proposed, 3) the operational knowledge level of the respondent concerning his own operations, 4) the agency's autonomy or independence, 5) the magnitude of communications expenditures, (all-inclusive media used, e.g. letters, tapes, travel, telephone, and other methods), 6) his feelings about his near term needs versus his intermediate and long term needs, and 7) any other data he feels might be appropriate to the telecommunications question. The last item could be in the interviewee's own chosen format to encourage non-classifiable but important information.

2. Extrapolate from the preliminary meetings and questionnaires meaningful overall (all state agencies) service requirements, traffic distribution, and traffic intensity for the three major population centers. Use this extrapolation to decide if aggregate traffic demand would be smaller, greater, or about the same as the "excess capacity" inherent in systems currently available.

3. Implement and promote pilot services which could be inexpensively

instituted, (for example a few "meet-me" audio bridges and PPTN/PTV teleconferences) and critically test their utilization.

4. Create a general package of potential user scenarios, case studies, and accompanying comprehensive questionnaires for mailing to at least all of the agencies responding to the survey discussed in section II of this report (the one already done). This questionnaire package should be well directed and refined by virtue of information learned in steps 1 and 2 above.

5. Using the information derived from this overall survey, create various technological and economic system models to ultimately describe the communications systems needed, the costs and time which could be saved, the enhancements to existing distribution systems which would be required, the specific communications problems which would be solved, the political disturbances which are likely to result, alternatives available to users, and an assessment of technological trends to cope with further future shifts in the way people will choose to communicate. The results of such information could ultimately constitute the essence of a Pennsylvania Master Telecommunications Plan.

6. Distribute summaries of the work performed in step 5 to potential users surveyed earlier, and to others. Request specific feedback to refine assumptions made. Prepare an implementation plan, acquire the necessary resources, and implement new services in phases.

7. Continue to develop services and systems, monitoring progress, anticipating changes in technology, and deliberately planning for continued maintenance, service responsiveness, accountability, and growth to cover all users who can possibly be served economically.

There are many tasks not specifically listed above, but which are implicit in the process.

Anything Worth Doing

Lack of either 1) dedication to deliberate continuity of the planning and implementation process, or 2) maintenance of its flexibility, will create a situation where the whole exercise was probably not worth beginning. After all, if true needs exist, those having the needs will either spend the requisite resources to satisfy them or simply adjust and function without solutions. The Commonwealth of Pennsylvania can dramatically help many to communicate more efficiently. But remember this: No one in the year 1800 knew they needed a telephone.

V. TRAFFIC SUFFICIENCY - A NECESSARY CONDITION

The antithesis of aggregation, or the sharing of facilities, is having "dedicated" facilities for any single user. Many applications require dedicated links among nodes. The requirements are related mostly to a user's operational constraints in delay (or non-delay), location, economics, alternatives and other factors which he is bound by.

Sufficiency vs. Delay

As mentioned earlier, one of the most important telecommunications considerations is a user's ability to delay or tolerate delays in the delivery of messages or programming. Should the user not be able to tolerate delays, the question of traffic sufficiency in support of his desire for dedicated circuits is moot. Non-delay constraints mandate sole exclusive use. Little traffic is carried over the Washington D.C./Moscow "hot line", for instance, but it is "dedicated" because when it is needed, it is needed immediately. The same may follow for a state's emergency or police communication system.

But assume delays might be marginally tolerable by a user. His large magnitude of offered traffic into a network might still warrant dedicated facilities.

Sufficiency vs. Geography

One key determinant in warranting dedicated facilities instead of using shared facilities is the distribution of message origins and destinations. If the points of communication (nodes) are few, (e.g., if several hours per day of messages or programming are originated at only one point, and are received at one (or more) other points which are always the same points), dedicated channels would probably be warranted. This would be true regardless of the other hours of the day the channel (or network) lies idle, since other potential users may not have coincident origins or destinations. Unique needs, in other words, may warrant dedicated facilities if the traffic volume is sufficiently high to warrant the corresponding investments.

Sufficiency vs. Economics and Alternatives

But the paragraphs above are merely prefatory to the question of: "How much traffic is necessary to justify a dedicated network?" There is no easy answer with an agreed upon common denominator. But the answer can be best approached, for lack of other measures, using a combination of two economic factors. The first factor is a supply and demand factor. That is to say: What is a user who believes he wants a dedicated channel or network, willing and able to pay for such service? The second factor is an alternative factor, for example: What would it cost to communicate using some alternative, or other medium (e.g. paper mailing, tape mailing, common carrier shared service, drop the idea, etc.)?

The first factor, willingness and ability to pay, is frequently very sensitive to the number of users ultimately served. For example television or radio broadcasting can often justify relatively large expenditures for dedicated facilities, (although per user the cost can be relatively small), because of the great number of users served. Conversely, the smaller the number of users served, the more difficult the economics may be to justify. This factor creates the seed for all common carriers -- even in transportation.

The second factor, the economics of using alternative media, is one which if considered at all is considered when willingness and/or ability to pay for dedicating communications channels comes out negative. Use of alternative shared media is usually a level of compromise for those users who desire dedicated communications channels. Yet potential users of dedicated telecommunications circuits must recognize alternatives, assess the cost and operational impact of using other media, (including switched networks), and even if they are both willing and able to pay for dedicated networks, they generally make a choice which is the most cost efficient and operationally palatable of the alternatives available.

Economic Sufficiency for Leased Service

Should a decision to go with a switched shared network be made, the cost is not automatically lower. The cost will depend upon the traffic between the two nodes. The traffic offered to a switched network is billed to the user per the amount of time channels are in use. It is easily conceivable, therefore, that standard rates for a

large amount of message (voice) traffic carried through shared facilities over long distances could be substantially higher than if that same traffic were carried over a dedicated line. The break-even point is probably at a few (two to five) hours per day. If the traffic is less than this between given points, per-minute (switched) rates will be less expensive. If more than the break-even amount of traffic is offered to a network between the same given points, dedicated facilities will be less expensive.

VI. TELECOMMUNICATIONS MANAGEMENT - A MODEL FOR ADMINISTRATION

There is perhaps a lesson to be learned from the telecommunications development of many U.S. corporations. Most have moved to centralize the information functions of the organization. Having strong central authority and responsibility in a corporation, their objectives of telecommunications efficiency and aggregation may often be mandated. Conversely, individual autonomous state agencies must be persuaded by someone to streamline their total telecommunications activities. Nevertheless, there are similarities between a corporation's operations and those of a group of state agencies. Such bear mention, and possible emulation. Enhancement of central administration may well be possible in Pennsylvania to make operational services even more efficient.

The following quotation appears in Datapro Research Corp. literature:

"The design and management of a corporation's telecommunications facilities need to be conducted on a centralized basis, taking all divisions of the corporation and all different users of telecommunications into consideration. Because of the economies of scale and scope for optimization, centralized design and management can save a substantial amount of operating capital, and can provide a corporation with better facilities than it would have otherwise.

Booz-Allen & Hamilton experience shows that organizations carrying out a centralized audit of conventional telephone facilities typically

show savings of 8% to 15%. This savings is soon lost if centralized management procedures do not follow up the controls on a permanent basis.

Telecommunications management is rapidly becoming a much more complex job. The complexity is arising first from the new types of tariff structures and services such as those of the specialized common carriers, the interconnect industry, the satellite common carriers, and the value-added common carriers. Second, it comes from an increase in the equipment complexity and diversity, for example computerized exchanges, concentrators, intelligent terminal controllers, data network hardware, satellite demand assignment equipment, radio facilities, and so on. Third, complexity arises from the need to incorporate diverse traffic into the network facilities, such as data transmission, facsimile, video, electronic memoranda, security monitoring, and radio paging. Fourth, it may be difficult to establish the tradeoffs between various reasons for travel and telecommunications, and secretarial services and telecommunications.

Efficient telecommunications management is particularly important today because telecommunications costs in most corporations are rising more rapidly than the inflation rate. Surprisingly few corporations have tight centralized management of their telecommunications resources. Those that do rarely take the broad perspective of communications tradeoffs, including the travel budget, the secretarial costs, and data processing budget.

A number of stages can be observed in the development of telecommunications management:

STAGE 1: No centralized management. Lines and equipment are leased haphazardly by user departments.

STAGE 2: Centralized planning and management of the corporate telephone facilities. Optimization of separate data networks by data processing system designers.

STAGE 3: An attempt to combine the various data networks into an integrated data transmission facility, possibly including a message switching system.

STAGE 4: An attempt to combine the data and voice facilities into an overall optimized plan.

STAGE 5: A study of all forms of corporate communications including internal mail and memo typing, executive travel, and use of information resources.

STAGE 6: Cost optimization of all forms of corporate communications.

To achieve Stage 6 is a very complex operation. Few corporations have contemplated it yet, let alone succeeded. The technology becoming available will make it increasingly profitable."

Various Commonwealth of Pennsylvania agencies may be difficult to aggregate beyond stage 2, but many of the elements of stages 3 through 6 can be performed both individually and collectively. In fact, with the planned creation of the statewide data processing network, many agencies will already be moving into stage 3.

It can be safely concluded that despite the autonomy intrinsic to many state agencies, much has been done in Pennsylvania to streamline telecommunications functions. But it can just as safely be concluded that support for more centralized planning and management can effect even greater rewards and higher efficiencies. The enhancement of centralized telecommunication administration in Pennsylvania is therefore urged.

VII. INNOVATIVE SERVICES - NO NEED TO WAIT

There have been many newspaper articles and magazine articles in recent months and years with exotic descriptions of telecommunications systems which are revolutionizing the way we conduct business and commerce, provide and receive entertainment, conduct education or learn, converse and correspond, compute and process data, and perform myriad other functions. Terms like "satellite communications", "fiber optics", "electronic mail", "teleconferencing", "video disks", "personal micro-computers", "videotex", "electronic mail", "interactive television", and a host of other high technology terms are tossed about with reckless abandon. And to most people such terms seem futuristic. This is because although such articles are usually written about currently implemented systems, potential users of these advanced systems have had little direct exposure to them.

Proceed to Implement, but Plan Carefully

The key to taking advantage of new telecommunications technology to increase productivity or efficiency, and to effect cost savings available from new telecommunication technologies, is to actually implement such systems, exposing the users to them, and thereby generating familiarity and applications among users. Bear this fact in mind: New technologies which have been proven eminently beneficial to users are available now. Greater advantage can be taken of new telecommunication technologies if the increased level of planning necessary to increase their development is vested in more people with

insight, who understand and can turn user needs into firm plans, who can implement new systems which integrate into existing investments, and who understand the full range of the economics involved.

Getting Started with a Technical Barrier

Too often "rapidly changing technology" becomes the excuse for inaction. Tomorrow's promise of lower equipment prices or more powerful or flexible features in certain technologies frequently urges planners to wait. Increased penetration of institutions with compatible and innovative equipment such as micro-computers always promises a critical mass to spur development of more efficient ways of using them. Currently functioning systems are often, and even justifiably thought of as being adequate, and even quite satisfactory for their intended purpose. They are then frequently ignored until they become inadequate, at which point they are patched up or even abandoned.

Going Too Far

On the other end of the spectrum are systems which are at inception so over-capable, that they cannot justify their own existence. Such systems often become solutions in search of a problem. Of these, the fortunate ones find their niches in the satisfaction of a worthwhile application.

Keeping Current

The key to utilizing new technologies is to strike a developmental balance -- understand their strengths, limitations, economics, and intelligent applications. And there are so many inter-dependent technologies becoming available, that planning for a wide range of new services demands current updates on each, and provisions for adopting them into new and existing networks as ongoing planning progresses.

Telecommunications Facilities vs. User Facilities

There is a logical split in technologies between transmission networks and user-based terminal equipment. This is mentioned because it somewhat eases the planning of telecommunications networks since there is some independence between the equipment which users do now and will later operate, and the telecommunications networks supporting them. "Telecommunications planning" is not as severely impacted by change, therefore, as are "applications and operational planning". User equipment which operates over telecommunications links is most frequently designed to operate with certain telecommunications industry standards. This is usually the case even though dramatic changes in user applications occur. As an example, consider the increasing proliferation of television programs containing information in closed-caption format for the hearing impaired. This service can be provided with little or no change to existing television transmission systems, including Pennsylvania's. Other comparable enhancements which could be transmitted over existing Pennsylvania television systems is teletext -- the transmission of alphabetic

letters, numbers, and other symbols to television sets statewide or regionally, for announcements, news, or other information dissemination desired.

Proliferation Spurs Development

There is an underlying fundamental reason for the compatibility which sprouting new technologies have with existing telecommunications plant. It is related to proliferation of existing networks and user instruments. Fitting into existing well-known and widely-used standard systems increases the market penetration for new user instruments. For example, there are a large number of user applications which have been built to employ the U.S. television standard -- video games, personal computers, teletext, video compression devices, cable television, video tape recorders, video disks, and all sorts of special production type equipment. In digital data telecommunications, most schemes employ modems which allow transmissions over standard voice grade audio channels. They allow digital data applications much more extensive proliferation since voice grade channels are themselves prolific.

Recap

The theme of this discussion is this: Waiting for development or deployment of new technology applications, before building telecommunications networks to support them, can prevent near-term implementation of efficient and useful networks and associated savings. Planning for adaptive telecommunications growth, however, can indeed catalyze such networks.

VIII. TELECOMMUNICATIONS ACTIVITIES - POSSIBILITIES

Currently there are systems in place in Pennsylvania for delivery of telecommunications services, notably the Pennsylvania Public Television Network and the state-owned microwave system. These have potential for vastly improved service potential for relatively little capital outlay, providing cost savings in time and effort for many.

Teleconferencing

A teleconference is a form of communication whereby meeting participants are gathered together in geographically dispersed locations, which are "linked" together via some type of telecommunication lines.

Teleconferencing can take the form of video, audio, and data (computer) and will be discussed individually in the following sections. It should be noted that video teleconferencing also includes audio capabilities in various configurations (e.g. one-way video/two-way audio, etc.). The essential differences among the three media for teleconferencing are the differences among visual, voice and typewritten communication. The fundamental characteristics are not likely to change in the near future.

Generally, wideband transmission costs are one of the largest single operational expenses. Much in demand, therefore, are clever video systems which use inexpensive narrow band transmission. Slow-scan

video, which sends a still image every few seconds, is an example. Such systems will, in effect, create hybrid media between the categories we identify as audio and video. Other systems which are very expensive "compress" the video in bandwidth by eliminating picture element transmission redundancy. However, Pennsylvania has several unique opportunities to develop such services which do not require compression, based almost solely upon the increased utilization of existing transmission (PPTN) and terminal (PTV station) facilities.

Given some of the potential advantages which can be derived from teleconferencing, certainly there are times when organizations in the Commonwealth may wish to opt for teleconferencing as a means of conducting business-oriented meetings, staff continuing education programs, or special programs of interest to the community it serves. Travel costs, increased audience coverage, and overall improved communications may be realized, especially when meeting configurations involve point-to-multipoint interaction among participants.

Because the programmatic requirements of many organizations, such as state agencies, preclude the need to have 24-hour teleconference facilities and services, the most desireable means of satisfying these needs would be to share such facilities with other organizations in the Commonwealth. The Pennsylvania Public Television Network, with its past experience and the resources available for telecommunication services could help realize the teleconference needs of organizations in the Commonwealth of Pennsylvania.

MEETING CONFIGURATIONS

The geographic location of the meeting participants and the ability to interact with participants at distant locations, are extremely important considerations in developing and executing any teleconference. In terms of video conferencing, the two most common configurations are point-to-multipoint and point-to-point communications. A brief discussion of both these configurations follows.

Point-to-Multipoint

Point-to-multipoint format is perhaps the most appropriate configuration for most applications. In this situation, the program speakers are located at a single location. The program is then transmitted to and received by a multiple of locations where viewing audiences have convened. This meeting configuration is most suitable for meetings where most of the primary "keynote" communication is done at the point of origination by the program speakers. The role of the viewing audiences is primarily to ask questions or make comments pertaining to the content of the presentations. Communication with the conference speakers is primarily achieved through telephone "call-ins" to the originating locations. (One-way video/two-way audio.) However, this is not the case with the PPTN system, which uses its own audio lines in lieu of using telephone lines. This can be considered as an asset of the PPTN, for teleconferencing, since the use of audio lines will usually guarantee that the audio portion of a teleconference will be of a higher quality than with the use of

conventional telephone lines.

Again, the PPTN survey of communication needs of organizations in the Commonwealth bears out the fact that a point-to-multipoint configuration would undoubtedly be the most likely candidate for many teleconference activities in Pennsylvania. Survey results indicate that there is considerable volume of activity among Commonwealth organizations for both conferences and seminars. Conducting seminars would lend itself very easily to point-to-multipoint teleconference configurations.

Point-to-Point and Multipoint-to-Multipoint

Point-to-point communications is configured such that each meeting location is able to interact with every other meeting location one at a time. It is frequently hard to distinguish when a point-to-point configuration becomes a multipoint-to-multipoint configuration that is when more than one set of point-to-point locations are interconnected (e.g. the ABC Nightline show with conferences among several participants). But whether it is important to make this distinction or not is questionable. It can safely be assumed that the latter configuration increases primarily in complexity, and therefore in cost. But the value of multipoint-to-multipoint connections is unquestionable when there are meeting participants in several locations who have contributions to make to a discussion. Usually such configurations become quite expensive, but in Pennsylvania when the PPTN network may have time to schedule these activities, costs of multipoint-to-multipoint teleconferences among PPTN nodes are expected

to be exceptionally reasonable.

Point-to-point video teleconferences can also be correspondingly inexpensive in Pennsylvania. Point-to-point meeting configurations are especially effective for small meeting groups using two-way audio and video. Thus PPTN, with its two-way video capabilities, could lend itself quite easily to this type of meeting configuration.

MEETING FORMATS

Two-way Video/Two-way Audio

This format, as the term implies, enables meeting participants to view and communicate with other participants. Two-way video/audio most closely emulates an actual face-to-face meeting. It is generally also a more costly mode of communication than other formats due to the additional channel capacity required for such communications. (But in Pennsylvania, the channels may already be available for use.)

Two-way audio/video is best for point-to-point or multipoint-to-multipoint meeting activities involving only a few participants at each node, and where meeting discussions are anticipated to be fairly balanced among meeting paticipants.

PPTN has a very valuable resource in its two-way capabilities for fully interactive teleconference applications. This two-way capability could be very valuable in terms of offering this service to, for example, various organizations with two-way audio/video

requirements with its field offices in the Commonwealth. Since there are two way nodes in both Philadelphia and Pittsburgh already, a microwave link from the PPTN system to Harrisburg (only one hop required) would bring in the third major geographical node. State agencies and non-profit organizations could have a ready-made video meeting service. In addition, the PPTN system could be used to conduct such conferences among Erie, Scranton, Hershey, Bethlehem and State College as well.

One-way Video/Two-way Audio

This format is normally the most common mode of conducting a video teleconference (although the PPTN is able to utilize the more technically sophisticated two-way audio/two-way video format and thus is an exception to the rule). This format enables the viewing audience to listen to and communicate with meeting speakers. Usually this format is more conducive to meetings where certain key participants are located on the same premises to deliver the majority of the communications involved in the meeting. One example would be a panel of conference speakers or an instructor teaching some type of course, (point-to-multipoint).

PPTN may want to consider this type of video teleconference format as a viable means of providing additional services to citizens in the Commonwealth. As the PPTN survey on the communications needs of Pennsylvania organizations indicates, there is sufficient volume of meeting activities among these organizations which might be conducive to this type of meeting format.

VIDEO TELECONFERENCING

General Description

Video teleconferencing involves visual as well as audio capabilities. The degree to which such video capabilities are used for a given meeting will depend on the format, such as one-way video/two-way audio, and so on. The following is a brief description of the various formats of video teleconferencing and some of the potential applications which PPTN may want to consider in expanding or improving the services which it offers Commonwealth citizens.

Video Teleconferencing and State Agencies

State organizations have the need for establishing and maintaining communications internally, as well as with the public they serve. Internal communications applications for teleconferencing lie primarily in the areas of Conferences, Seminars, Inter-agency meetings and Public hearings. For example, a central staff group or a board of directors of a given state agency may set up a teleconference to discuss the impact of certain legislation on its operations with staff members located state wide. Questions would be fielded from staff members at the receiving sites after the discussion. A group of administrators, who are geographically dispersed, may wish to meet on a regular basis to maintain cohesive internal operations among its various branches. A teleconference format (in this case two-way audio, two-way video/multipoint-to-multipoint) would allow the administrators face-to-face interaction without the expense and time

of traveling for such meetings.

Most state agencies have professional staff members who require being kept current on various issues and technologies in their field. Workshops, university courses, or symposiums, which are conducted in the teleconferencing mode, would allow professional staff to easily maintain their accreditation or current awareness in their fields without considerable time away from work, which travel would entail. New techniques in the health sciences, teaching methodology for the handicapped in public schools, or new vocational education programs for those in correctional institutions are such examples of program enrichment for professional staff.

Another important operation of state agencies is to maintain good communications with the public it serves. A state medical facility may wish to allow its patients to view a series of programs on such topics as health maintenance for diabetics, alcoholism in the family, or cardio-pulmonary resuscitation techniques.

Keeping abreast of local, state, and national government affairs is also important for state agencies. "Live" coverage of such activities could be made possible for viewing by state agency staff, where timeliness of receiving such information is an important factor in an agency's operations or policies, or to the State as a whole. For example, the Governor of Pennsylvania or a state legislator may have obtained information or been involved in a decision-making process which affects certain state agencies or the entire State. This state legislator could then relay his messages to the appropriate receiving

locations (e.g. any of the public television stations) within the Commonwealth. An important aspect of using such a teleconferencing mode in this type of situation is that not only are a large number of people able to hear directly from the Governor or legislator regarding the issue at hand, but there is also potential for a great number of people to directly interact with the legislator, asking questions or making comments. The public television station may also tape the program. Such taping can be done with very little extra expense beyond the cost of the tape itself. Those who missed it initially could watch it shortly after.

Advantages of Video Teleconferencing

Video teleconferencing can be an exceptional means of communication when a large number of people, in geographically dispersed locations are involved. Some of the benefits derived by those organizations which have become involved in teleconferencing could also be applied to state agencies.

1. Coping with Reductions in Travel Budgets: Teleconferencing foregoes the need for attendees to travel to distant locations to attend meetings. Such travel expenses can be considerably reduced, especially if travel requirements for intra-agency meetings are heavy. This factor becomes especially important when or if a state agency's budgetary allocation for travel is reduced. By the way, this is true for audio teleconferencing as well. According to extensive studies,

60 percent of all meetings could be handled by voice communications only.

2. Distance and Location Insensitivity of Satellite Communications: In meetings where a large number of attendees are located in geographically dispersed locations, national teleconferencing via satellite becomes an attractive alternative due to the relative "distance-insensitivity" and the geographic-insensitivity of using satellites; that is, one satellite blankets a large geographic area. Therefore, the costs incurred by adding extra receiving locations are only a matter of the "ground" costs if any (i.e., use of a transportable earth station). Thus the more people attending, and the more geographically dispersed the attendees are, the more cost effective "point-to-multipoint" teleconferences can become.

For most of the teleconferencing within the boundaries of Pennsylvania, however, satellite teleconferencing will undoubtedly be significantly more expensive using satellite teleconferencing than having participants drive to the nearest PPTN network node. But Pennsylvania is not isolated. There is significant interaction required with other parts of the nation. Currently, all of the public television stations in Pennsylvania have satellite receiving antennas. They are also nodes on the PPTN system. Any or all of them could be converted to have transmitting capability for very little in capital cost.

3. Increased Audience Attendance: An issue closely related to the potential travel expense reductions which teleconferencing can provide, is that a greater audience in attendance is possible. Staff members who are not budgeted to travel to certain meetings are able to attend, instead of receiving "second-hand" reports of meeting items (which can be prone to error as these meeting details become third or fourth generation accounts). In addition, time can also be saved since additional meetings to pass on such information to those not able to attend the initial meeting is not required. Because face-to-face interaction with a larger audience is possible, communications may become vastly improved.

4. Ease of Schedule Coordination: Another benefit which can be derived from teleconferencing is increased flexibility of coordinating the varying and busy schedules of attendees. It is generally much easier to schedule a few hours of a busy manager's time for a meeting than to tie up his/her time in traveling to and from the meeting as well.

5. Reduction of Travel and Associated Costs: Not only are many state and federal agencies facing budget cuts for such activities as travel, but the cost of travel itself is increasing at a rapid rate. Hotel accommodations, per diem expenses, fuel costs, and air fares are reason enough to investigate the potential cost savings of teleconferencing, especially when a large number of people are involved in a number of different locations.

6. Improved communications through face-to-face interaction: This benefit particularly applies to PPTN since the network has two-way video capabilities.

When a Conference Call is Not Enough

Why a video teleconference, when a simple telephone call "conference style" may be sufficient? Of course, there are many times when a conference call is a totally acceptable and perhaps a more desirable means of conducting business. Such is the case when the number and locations of participants are few, and informal tone to the meeting is quite acceptable. However, there are times when the visual qualities of a video teleconference can serve as a much more effective means of communication:

1. Point-to-Multipoint Meeting Configurations: When a large number of people in dispersed geographic locations are required to attend a meeting or course where the program speakers can be located at a single location, all attendees have a "front row seat" in viewing the speakers and any graphic displays presented.

2. Simulation of a Face-to-Face Meeting Environment: Eye contact is an extremely important component of communication. When the focus of a meeting is to make a specific or highly critical point, the ability of attendees to see the speakers can be an important tool in establishing interpersonal communications with attendees. A feeling of increased audience interaction can also be achieved by facilitating visual as well as aural responses to questions asked by teleconference participants.

3. Establishment of Personal Rapport with the Audience: In the same vein, when meeting attendees are able to view the speakers, a much more personal tone can be established. This tone can be especially important for intra-agency meetings where administration is speaking to its staff members located in distant locations. In this setting, staff members feel a more personal rapport with administrative staff, and less divorced from administrators as individuals.

4. Importance of Charts, Graphs or Slides in the Program: It is critical in many meetings, courses, and workshops to rely on graphic materials for effective communication. In the teleconferencing mode, such visual materials can be easily viewed by all meeting attendees.

Audio Teleconferencing

(The following discussion is based, in part, on: ELECTRONIC MEETINGS by Robert Johansen, et al, copyrighted by Institute of the Future.)

The apparent simplicity of audio conferencing is deceptive. It is easy to view this medium as a simple extension of the telephone: if two people can talk to each other so easily, why not three, four, or even twelve? For many years, the telephone company has provided a "conference call" service that is, in effect, a basic form of audio teleconferencing. However, the telephone traditionally has been viewed as a two-party communications medium. People do not think of the telephone as a group communications medium. Nevertheless, telephone technology seems to be quite adaptable to group conferencing needs, as demonstrated by systems developed specifically for this purpose.

As stated earlier, 60 percent of all meetings held could be handled by voice communications only.

Permanent and Portable Conference Room Systems

The technology for audio conferencing can be either permanent or portable. Conference rooms can look much as they did before the audio equipment is installed; the only obvious signs of their new function are movable table microphones and speaker cabinets hanging in corners of the room. It is important to recognize that, as stated earlier, PPTN can provide interconnection of such rooms with high fidelity audio circuits, greatly enhancing the medium by helping eliminate participants' feeling that the medium is artificial.

The NASA audio system is perhaps the most extensive network of permanent audio conferencing rooms currently in operation. At NASA,

the need for audio conferencing grew out of the early U.S. space program as geographically dispersed contractors and NASA sites worked together on the Apollo Project. In addition to voice transmission, the conference sites were also equipped for high-quality telecopying capabilities to allow immediate exchange of diagrams and technical information. Today, rooms have both audio and telecopy equipment. A NASA facility in Huntsville, Alabama, provides the "audio bridges" for rooms engaged in a conference.

The NASA System is used for regular committee meetings and exchanges among sites, as well as for coordination among members of specific projects. The project-oriented uses, in which geographically separated work groups have a high need to communicate with each other and a common task to be performed, seem to be the most effective.

A variety of portable audio conferencing equipment, available from a number of manufacturers, can transform an ordinary conference room into an electronic meeting center. The University of Wisconsin-Extension relies on such equipment to conduct continuing education courses on a regular basis. Portable units are available at 200 sites around the state, many in public buildings. Professors remain on campus in Madison or Milwaukee or hold class from some more convenient location. Students simply attend class at the nearest court house or public library. (We will discuss Community Access Centers later.)

The costs of both permanent and portable systems are low. Audio teleconferencing uses inexpensive telephone lines. Interconnection to

the State Microwave System would be even less expensive. For systems which use the existing telephone network, the cost is especially low, although it can increase as more people join the conference, (toll call charges). Permanently installed audio conferencing systems which use dedicated lines are more expensive to use because of line charges, but they provide greater reliability and generally higher voice quality. Also, the higher cost can be justified by higher use. The University of Wisconsin-Extension, for example, estimates that its system costs only 25 cents per student contact hour, not including the intructor's time (Perkers and Riccomini, 1976).

Meet-Me Bridges

A dial-up or "Meet-Me" Bridge is a good example of state-of-the-art audio teleconferencing, and is perhaps more flexible than permanent or portable audio conference room facilities. Conference participants can dial a central number, at a pre-arranged time, from any telephone anywhere, and with conference access screening by a bridge operator, be connected with two to twenty or more other conference participants. Users of meet-me bridges are almost always pleased with the time and energy they save by having the capability to attend meetings while at the office, at home, or conceivably from a mobile telephone.

Extrapolating this concept to Pennsylvania state agency usage, one or more briges could be installed in each major Pennsylvania city, interconnected by state-owned microwave circuits and/or PPTN circuits to save toll charges, and virtually any agency (or non-profit institution) could very economically conduct local, statewide,

regional, or national audio meetings.

It is true that the Commonwealth of Pennsylvania has a state-owned audio bridge arrangement already. This one is much like the Bell System operates where an operator establishes the connections one-by-one. Experience in audio teleconferencing would therefore be quite economical to gain for many agencies, and any success in using this medium could easily generate needs for many bridges.

Videotex and Teletext

(The following discussion is based in part on definitions supplied by Logica, Inc. in their study on "Electronic Publishing" for the PPTN.)

Videotex or Viewdata uses a video display (a TV set) to disseminate and/or retrieve information. It is configured as a two-way, interactive system which uses a combination of a television receiver, local processing, and a remote data base accessible through the public telephone network. "Pages" of information are stored in the data base where they can be easily accessed by a given user. The "page" is displayed on the screen. In terms of content, the Viewdata data base can encompass a great number of subjects and has been likened to an "electronic encyclopedia", drawing its information from a variety of books and newspapers.

Teletext, on the other hand, is a one-way information system which employs unused capacity, (lines), in the broadcast television signal to transport data to "modified" television receivers without

interferring with the normal program. The modification is a small inexpensive decoder connected to the TV set. Teletext services require that a user wait several seconds until the page he/she selects is being transmitted so that his receiver can "capture" and display the requested page of information. The content of teletext services is primarily based on magazines and newspapers.

PPTN could take advantage of videotex services, and especially teletext services through its broadcast signals. Recall that such information can be carried inside the video signal without system modification. Such information as news headlines, financial news or sports headlines could be offered to its viewers.

Computer Conferencing

Computer conferencing, on the surface, least resembles a conventional meeting in terms of environment and time frame involved. There are no face to face visual and aural capabilities, therefore the printed word becomes the primary mode of communication.

Computer conferencing can take on many forms, from simple message routing activities to the utilization of other computer resources such as statistical packages or data bases, depending on the level of sophistication of the conferencing system. The most common form of computer conferencing is where users type their messages to other conference participants on standard computer terminals, which are linked to the computer network. Participants receive printed messages at their terminals each time they access the computer system and

request that their messages be retrieved.

Computer conferencing lends itself well to "meeting" situations where it is desirable to allow conference participants the flexibility to send and receive messages at their convenience. This is an especially attractive medium when participants require segments of time to reflect or do further research before responding to a message item. Computer conferencing is also the least likely medium to disrupt staff schedules since all "meeting" activities take place at their convenience.

Currently, the Commonwealth of Pennsylvania is in the process of developing a state computer network. This network will allow for bidirectional communications throughout the Commonwealth among government offices and state universities. This computer network, once in place, would lend itself easily to computer conference activities with which PPTN may want to try to interconnect.

Closed Captioning Services

Closed captioning services have most conventionally been used for those viewers with hearing disabilities since wording appears on the television screen which "captions" program content. Special receiving equipment is required to decode the signal for program reception.

One of the primary drawbacks of closed caption services is that the procurement of additional equipment is required to receive programming. Because such services are not in heavy use, expanding on

the applications and types of programs made available have been limited.

Harrisburg Department of Education Link

The Hershey public television station currently has plans to move its facility from Hershey to Harrisburg. When this move takes place, the PPTN facility could easily be tied into the Department of Education in Harrisburg using a microwave link. This linkage would enable PPTN to provide such services as teleconferencing and other specialized programs.

As the user survey conducted by PPTN indicated, there is a very heavy concentration of potential users of teleconference services in the Harrisburg area, particularly for Commonwealth employees. Thus, this PPTN link with the Department of Education in Harrisburg would be strategically located for offering a tremendous variety of teleconference and other services, particularly since the Department of Education already has production capabilities.

Hahnemann Linkage

The Hahnemann TV Network (HTN), a medical television network in eastern Pennsylvania, offers closed circuit color television programming designed to meet the professional education needs of such hospital personnel as physicians, nurses, and dieticians. A telephone hookup enables viewers the ability to interact with program presenters.

The Hahnemann TV Network connects Hahnemann Medical College and the Hospital of Philadelphia with Wilkes-Barre and Bethlehem area hospitals via microwave repeaters. Instructional Television Fixed Service (ITFS) is the primary means of interconnecting individual participating hospitals. The HTN has also purchased a satellite receive dish located in northeastern Pennsylvania for satellite program reception, such as that offered by the Association of Hospital Television Networks (AHTN).

The PPTN, having microwave links in or near the Philadelphia, Scranton, and Bethlehem areas, could tie in with the Hahnemann TV Network in these areas with relative ease. With such an interconnection with HTN, the PPTN could then help to extend HTN program services to other areas of the Commonwealth by feeding programming along the PPTN microwave system. Thus, medical facilities in major metropolitan areas of the Commonwealth which currently cannot receive HTN programming could be served through PPTN interconnections.

Pennarama System

The Pennarama system is a continuing education cable television network serving Pennsylvania. The programming agent for Pennarama is the Pennsylvania State University. Programming is originated at the Public television station, WPSX, located at the university. Pennarama is still in the process of being completed, but once all network nodes are in place, the Pennarama system will ostensibly cover the entire Commonwealth of Pennsylvania. Currently the programming produced is

mainly in the area of adult and higher education.

The Pennsylvania Educational Communications Systems (PECS) is comprised of the hardware that carries the Pennarama system and is provided by a consortium of cable companies. Since the public television station, WPSX, is connected to the Pennarama system, the PPTN could then have access to and from this system. Thus, the PPTN would be interconnected to a large majority of the cable systems in the Commonwealth.

Berks Community Television

BCTV (Berks Community Television) provides interactive television programming geared toward senior citizens and other special interest groups. Its unique feature is that it is one of the few, if not the only two-way-video interactive cable systems. The original cable distribution system was scheduled for replacement. But the "parent" cable company, decided not to remove the old cable, but rather to use it for video transmission back to the system head-end. The direction of information delivery of the old cable system was therefore reversed so that the information would flow upstream. Microwave is also used to link several schools and outlying cable companies to BCTV. Programming originates from the BCTV station in Reading, PA, and viewing audiences are able to interact with program presenters via telephone.

The PPTN may want to view the Berks Community Television system as a model for effectively delivering local programming to special interest

groups in a given geographic area. In addition to serving the programmatic needs of senior citizens and students, the two-way interactive system enables local government officials a more direct line of communication with constituents. As the broadcast and interaction of city council meetings is done on the Berks system, so could interaction occur on a state level. A system similar to the BCTV network would very likely be a viable means to provide other urban areas without primary broadcast stations (such as Franklin, PA) with a two-way video interactive system for the broadcast of state, local or community-oriented programming. Communication by state government officials to the public would be a valuable service which the PPTN could provide much of the interconnection for.

Community Access Centers

The concept of Community Access Centers normally refers to colleges, universities, libraries, or other public meeting areas which are capable of receiving a signal (usually via cable) for program reception. Such centers are well suited for receiving such programs as college courses, public hearings, or other community-oriented activities. Services may range from both full motion video to audio teleconferencing modes.

Community Access centers are a particularly desirable (and inexpensive) means of distributing programming to the public since the meeting areas are usually already available to the public. Many times the program reception capabilities are already in place. Therefore, it is only a matter of getting the signal to these facilities. For

example, some libraries throughout the United States are connected to their local cable companies. Programming is frequently fed through the local cable system to provide college courses and other special programs.

In the Commonwealth of Pennsylvania, PSSC has identified three libraries as community access centers: the Altoona Area Public Library, Monroeville Public Library, and the public library located in Reading. Given the great number of cable systems in Pennsylvania, there are bound to be many more potential community cable access centers for program delivery services.

Opportunities Unlimited

We have presented a number of ideas which bear further investigation and investment of time, energy, and capital resources to realize the potentials of the best of them. Certainly whatever is done must be done with great deliberation to assure planning is responsive to needs and available resources.

The opportunities are great, but they must be seized.

APPENDIX F

Telecommunications Center Concept

THE PUBLIC TELECOMMUNICATIONS CENTER

Changes in communications technology make it possible and desirable to broaden the service and scope of many public television organizations.

The core idea is this: institutions and organizations already operating publicly chartered and financed broadcasting services can provide substantial savings to public service operations if they serve as the nucleus around which to develop and exploit newly available communications technology.

The rationale for such an expansion is four-fold:

1. Public broadcasting oganizations are already involved in assessing needs for community, public, and educational services; designing, acquiring and producing programing to meet such needs; and distributing such programs to a variety of target groups.

2. In the past, the total output of most broadcasting stations has been fed through a single broadcasting channel, television or radio. New communications technology is characterized by a multiplicity of channels: the old limitations need not be extended into the future.

3. Communications and information technology can make it possible to manage resources more efficiently through improved and consistent administration and training of personnel, distribution of information more efffectively and uniformly, and through direct contact with consumers of many public services.

> 4. No other public entity is so experienced and prepared to extend its scope and service. While esssential transitions and adjustments will be needed, the public broadcasting organization can be a key means to develop and secure a broad range of public benefits from new communications technology.

To many people, the phrase "new communications technology" means cable and satellites. In reality, the definition is both broader and more specific. For example:

Cable systems incorporate audio as well as video; they make it possible for interaction between supplier and user; they can incorporate not only the traditional motion picture video, but new forms of data transmission, referred to as teletext and videotext.

The satellite systems often referred to are useful in two ways: to interconnect program suppliers and ground-based program distributors (cable or broadcast systems). But such systems also can accommodate more direct consumer reception, and they, too, are capable of distributing digital data information.

Perhaps less grandiose and more immediately practical are the various audio and video cassette systems already available. Broadcast services are now including subsequent program distribution by audio cassette and video cassette as part of their

extended service. It is not difficult to imagine the next step; some of their services would never be broadcast, but would be made available only on cassettes.

Video discs provide a distinctive new collection of communication capacities. Contrary to popular expectations, the video disc is not merely a disc counterpart of the video cassette. It is a more comprehensive array of technology, including moving pictures, multiple channel audio, start/stop/freeze-frame/forward/reverse a frame at a time, computer retrieval access of particular frames, computer programed advice concerning the progress to be made in instructional sequences. It is a special new technological capacity, parts of which are available elsewhere, but the sum total of which is now found only in the video disc equipment.

Computers themselves, should be seen as an integral and integrating element of new communications technology. Once a large and expensive information technology, the computer has now come to the point where its substantial capacities are available at a fraction of their original cost. Their use as an instructional technology is now practical and reasonable.

These definitions provide an indication of the possibilities at hand. They illustrate the range of technological capacities that can now be brought to bear on public service and educational opportunity.

The issues that must be examined and dealt with are plentiful. They can be considered in the following categories: marketing, service, finance, regulatory/legal, and organization/structure.

Is There a Market?

The principal market to which the Public Telecommunications Center would address its capacities consists of private and public sector organizations with information and training responsibilities, including all levels of education and professional development; schools, colleges, community colleges, and professional education programs.

There is an important distinction between the relationship of a Public Telecommunications Center to these groups and that of a Public Television Station. For example, though the educational services of many televison stations have been well regarded and widely used, the inescapable fact is that most public television stations have been

limited in what they can provide for education consumers. Thus, the service relationship between the schools and the stations has been inevitably limited by the technical capacity of each station: essentially one channel with many demands and opportunities.

The concept of the Public Telecommunications Center broadens and diversifies the possibilities for service to the various training and education markets. It is no longer a matter of persuading them to buy an "ITV service;" rather that they can look to the Public Telecommunications Center as a way of designing and managing the various communications services that they need to have provided. An instuctional television service may be one of those needs, but it will be only one, and it may be provided through a multiplicity of channels, whether they are owned by the Center or leased by it on behalf of the educational clients that it serves.

While it is reasonable in some respects to think of the Public Telecommunications Center as an extension of public broadcasting stations, it is also valuable to consider it a substantially new concept, built on the station but by no means limited to its historical limitations and practices.

The market for the services to be generated by this new concept will consist largely of those public entities that can benefit from the large scale application of communications technology as an efficient means of organizing and distributing information and program resources. While each could undertake some of these operations individually, the economies of scale will surely benefit the institutions that participate in a Public Telecommunications Center.

The underlying assumption of the Center is that the broadened technical capacities that are now possible can be organized in such a way that an entirely new range of education and communications services can be designed, produced, distributed, and managed. Services and functions are a consequence of capacity to perform. The new technological opportunties have given new shape to these capacities and it is now practical to think of educational markets in a manner that was not feasible when speaking of television or radio alone.

What Service Does the Market Need?

The details of a particular situation will vary, but in most cases, the market will require the following kinds of services:

a. the professional design and production of communication strategies and materials appropriate to the execution of significant social tasks. The design of such strategies should include acquisition of materials as well as their evaluation in actual use.

b. practical working relationships with manufacturers and suppliers whose equipment will be leased or purchased.

c. indexing and storage of materials (master tapes, films, computer-stored source material) that will need to be used for instruction. (It is unreasonable that each separate unit would be able to retain all of the needed materials on its own premises.)

d. access to an equipment "store" that will provide the kind of hardware for sale or lease that is necessary for particular instructional situations.

e. repair and maintenance of equipment, whether or not it is provided from a central organization. Most institutions have no routine and effective way of handling this important requirement, so needed equipment is often not available in good repair.

f. access of viewing and learning centers that are not necessarily located on school or campus premises. Such "extension centers," perhaps in office buildings, factories, and other places of employment would enable the education institutions to reach students where they work.

g. means of maintaining ongoing arrangements with other educational institutions to secure

materials that they have prepared, or to enter into agreements for the joint financing of mutually important educational materials.

h. administrative services that deal with copyright and ownership questions associated with particular materials. Individual organizations rarely have enough demand for these services to retain the experienced talent and professional assistance that is often required. Therefore, opportuniities are lost or risks are incurred that could result in costly litigation. This is especially true in light of new information technologies.

i. consultation or direct services in dealing with outside distributors, such as cable systems. School and college groups rarely have expert counsel on these matters and they will be called on increasingly for representation of their needs or demands for satisfying their requirements.

Apart from these operational needs, the market needs one additional type of assistance: initiative, sustained over time.

It is easy to understand, for example, how planned changes in educational operations can be subverted by particular emergencies or issues. Moreover, school systems are rarely sufficiently capable of securing and assigning the professional expertise required to work in many of the new and uncharted territories of communications technology.

Therefore, in order to provide a reasonable possibility that schools and other public educational institutions can benefit from the new

technological opportunities, they will need to develop constructive partnerships with external agencies that can provide the kind of services, and therefore the needed initiative, to work efficiently and effectively at these critical and comprehensive tasks.

How Can Such Services be Financed?

The chief reason for recommending the use of communications and information technology is to improve and extend opportunity at affordable prices.

In an era of increased private and public accountability for large investments in education, it is urgent that those managing educational programs take full advantage of resources and techniques that will yield a higher return for every dollar of public investment.

The introduction of communications technology does not inevitably introduce efficiency or effectiveness into educational operations. Whether this can be achieved depends very much upon the managerial and organizational arrangements that are made.

In suggesting the Public Telecommunications Center as a means for carrying out many of these services and activities, we are recognizing that virtually all of the new technological capacities are volume-sensitive. That is, the more receiving points, the larger the number of potential users, and the lower the unit cost for operation.

The extent to which this is true will vary with a particular form of communications or information technology. The financial considerations appropriate to particular situations cannot usefully be examined in general or in the abstract. However, because all of the technology that is being considered here achieves greater efficiency with larger numbers of users, it should be clear that any means which finances these activities on a large scale rather than a smaller scale is preferable.

The specific means of finance can vary, of course. Among the main possibilities for financing the Public Telecommunications Center are the following strategies.

1. An agency of the state could be appropriated funds to finance the requisite services and could contract with one or more entities to execute the services.

2. An agency of the state could be appropriated funds to finance and operate the requisite services directly.

3. An agency of the state could earmark funds made available to school and college units receiving state funds. The earmarked funds would enable individual school units to work with the Public Telecommunications Center most serviceable to its needs.

4. Individual school or college units could through their own resources finance the consolidated operation of these services.

5. The Public Telecommunications Center, following its start-up period could operate the needed services on a "business-type" basis, charging to users the necessary costs to exist on a self-supporting basis. The Center will need to demonstrate that use of its capacities is more efficient than more traditional techniques.

Several criteria should be considered in selecting a particular financing strategy.

1. The source of funds should be stable over a reasonable period of time so that the necessary developmental work will not be thwarted.

2. The Public Telecommunications Center should be paid for its services by those agencies and institutions that consume them. Such agencies and institutions may be granted special funds for this purpose. It is important that the Center function as a service body and a financing strategy that reinforces its relationship with the "market" will be valuable.

3. It will probably be helpful to differentiate capital from operating expenses, although leasing arrangements from the Center could help reduce capital outlays by using institutions.

What Legal and Regulatory Accommodations Must be Made?

The regulatory umbrella for public broadcasting stations is the Federal Communications Commission. Its rules are geared to a one-channel system of non-commercial broadcasting. There are fewer than 10 dual channel operations in public television under the same licensee. While the F.C.C. has not yet applied its prohibitions against multiple-ownership to public broadcasting entities, it has come close to doing so. Its premise is that diversity of ownership will yield diversity of services.

The economic arguments against this convention, in the public sector are quite strong. And the economic arguments in favor of consolidation are equally strong.

Multiple ownership regulations in the public sector would encourage, though not require, the expansion and development of public broadcasting organizations into public telecommunications organizations. This means they could own, lease, and operate any information or communication technology which is deemed appropriate to the

satisfaction of its public purpose.

The regulatory body would need to be assured that the necessary organizational controls, access opportunities, and governance processes are adequate to the scope of service and responsibility. (Organizational possibilities are discussed in the next section.)

There is, however, a further possibility that will need to be considered very carefully. The concentration of responsibility, and the potential for needed exclusivity may require that organizations developing into Public Telecommunications Centers should be established with some of the characteristics of publicly regulated utilities.

This technique is frequently used in situations where an exclusive franchise to do business is considered essential to the proper discharge of social services (e.g., electric companies).

Another fundamental area for examination is the copyright law. While present laws are designed to protect the owner of copyrighted information and materials, there are unsettled issues associated with computer-generated and manipulated information. When the user can

assemble a desired array of information to construct a particular information package, who becomes the author? Who is the owner of the finished product? Who is the publisher?

Because the Public Telecommunications Center will surely be dealing with information of this type, it will have a clear responsibility to seek copyright accommodations that result in the broadest use feasible for the educational consumer, while acknowledging legitimate claims of copyright holders.

This area of regulation is important because the Public Telecommunications Center will rarely be only a consumer of copyrighted material; it will also generate such material, so its dual interests will require expert counsel and advice in developing, advocating, and implementing the necessary policies.

What Should Be The Organizational Options?

The first point to make is that the Public Telecommunications Center is not necessarily a single place. It is, rather, the organizational consolidation and coordination of various capa-

cities associated with electronic communications for public purposes.

The Public Telecommunications Center might be defined as: any non-profit institution or agency legally chartered to conduct regular educational, cultural, and public service activities and which does so through the use of a major and consistent use of any essentially electronic communications systems.

Such systems would include broadcast radio and television, cable, instructional television "fixed service," video discs, cartridges and cassettes, audio cassettes and discs and computer processing and information systems.

The Public Telecommunications Center, therefore, as a single organization could operate in a multiplicity of places, not necessarily even geographically contiguous. For example, a Public Telecommunications Center might develop uniquely effective instructional programs for inner city children with distinctive learning handicaps. The Center might provide those programs to other PTC operations for use in areas outside their immediate and regular sphere of operation.

The second point is this: it is necessary to contemplate that the government of a single state, commonwealth, county or municipal unit would constitute the single and sole authority for composing, supporting, and controlling a Public Telecommunications Center structure. Instead, it would be far preferable that public telecommunications authorities established and operated by regular government units and agencies would be active, peer participants in a pluralistic institutional structure. The degree of such governmental participation can vary. But in no foreseeable instance should there be rigid, unvarying, and inescapable control of a Public Telecommunications Center by one governmental unit or subordinate agency.

The particular ownership and governance arrangements for a given Public Telecommunications Center will vary according to the circumstances that are present at its early development. Some public broadcasting licensees may already have very effective terms with cable companies for the distribution of material; some may have distinctively effective relationships with their school systems that could lead to a useful growth

and expansion.

The range of ownership arrangements could run from a situation where a Public Telecommunications Center serves as the only licensee and owner for all electronic telecommunications services to a cooperative structure where the Center serves largely to coordinate and exploit opportunities.

While there are few guarantees in such matters, it is likely that a compatible governing structure and financing strategy will be the most successful arrangement.

However, with regard to financing it will be useful to consider a two-dimension matter: capital and equipment costs and operating costs.

Because electronic communications technology often requires heavy capital investment so that potential users can participate in operating programs, the Centers should have access to funds that will enable them to purchase and give, sell, or lease such equipment to the operating organizations.

At the same time, the financing of particular programs and services should provide the optimum opportunity for discretion and choice. Wherever possible school systems and other users should be

required to pay either full or partial costs for the services that they receive. This will turn out to be a practical way to gear the service of the Public Telecommunications Center to its users.

In special circumstances, where totally underwritten programs are made available to achieve particular educational benefits, exceptions can wisely be made.

How Should One Proceed?

The general concept of the Public Telecommunications Center has been laid out here. Beyond these general observations, the next step is to examine the extent to which some of these activities are already underway, to examine the extent to which the Center concept is appealing to the appropriate parties, and to convene a planning group to develop specific alternatives and details.

James A. Fellows
Washington, D. C.

April, 1982

APPENDIX G

Teleconference Descriptions

TELECONFERENCE DESCRIPTIONS

Situation

The Governor's Task Force on Criminal Activity is preparing to launch a new approach toward the combat of street crime in the inner city. The newly developed program is a radical departure from previous attempts. It provides innovative procedures, changes areas of responsibility, and will radically alter the methodology of Task Force field offices. The plan will be implemented at all the Urban Section field offices of the Task Force; these field offices are located in Pittsburgh, Erie, Altoona, Scranton, Allentown, and Philadelphia.

Task Force officials have identified four goals which must be satisfied in order to properly and successfully introduce the program:

1. All field offices must be introduced to the program simultaneously.

2. The importance of the program to the citizen and the Task Force must be emphasized.

3. The workings of the program must be fully understood to all who will be involved in carrying it out.

4. There must be an opportunity for field-level comment to identify local area peculiarities and intricacies visible only in the field.

To meet these goals, the Task Force has decided to call a meeting. Ten key people from each of the Urban Section field offices will attend, and the presentation will be made by five people from the Harrisburg headquarters. The Governor will make a five- to ten-minute statement to open

the meeting. The session will then turn to a detailed presentation of the program lasting about three hours. This portion will be open for questions only for the purpose of clarifying fact. Following, there will be a one-hour period where participants may pose hypothetical situations or suggest alternate methods. There will then be a two-hour period of adjournment for field offices to caucus and discuss the program with respect to their specific area problems. The meeting will then reconvene for two hours to hear the results of the caucuses.

Current Method (The Physical Meeting)

Having adopted the agenda, the meeting has been called for Wednesday at 1 p.m. in Meeting Room 4 of the downtown Holiday Inn in Harrisburg. The meeting will recess at 5 p.m. and reconvene in the same room Thursday morning at 8:30 to hear the caucus presentations. Each field office will dine as a separate group and conduct their discussion through the meal. All out-of-town participants will be lodged at the Holiday Inn. Each field office group should plan to travel together and use public transport when available.

The Pittsburgh delegation elects to travel by rail. They will meet at 6:15 a.m. at the Pittsburgh state office building, go to Amtrak Station by PAT, and board the "Broadway Limited" at 6:48. They will arrive in Harrisburg at 12:17, walk two blocks to the Holiday Inn, and register. A dinner reservation for ten has been made at the Locust Cafe for 6:30 p.m. The following morning they will board the "Pennsylvanian" at 10:50. When they return to Pittsburgh at 4:25 Thursday afternoon, they will have been

away for 35 hours, traveled for 11 hours, and, assuming a 2-hour dinner, will have spent 8 productive hours.

Sufficient notice of the meeting was given to allow the Erie group to obtain a 35 percent "SuperSaver" airfare discount. They will meet at the Erie International Airport to board USAir flight 108 at 6:05 a.m.; after connecting to USAir flight 132 at Pittsburgh, they will arrive at Harrisburg Airport at 7:49 a.m. Two taxicabs convey the Erie group to the Holiday Inn. Dinner reservations have been made for 6 p.m. at the Colonade Restaurant. They agree to meet the following afternoon at one o'clock for taxicabs to the airport and the 2:36 flight. USAir flights 69 and 271 deliver them back to Erie at 4:25 p.m. The Erie group has also been away for 35 hours, has traveled for only 5 hours, and has spent the same 8 productive hours.

Meeting at the railroad station, the group from Altoona will join those from Pittsburgh aboard the "Broadway Limited" at 9:35. They have decided upon dinner at the Alva Hotel at 6 p.m. Following the same routine as the Pittsburgh people, the Altoona delegation will arrive home aboard the "Pennsylvanian" at 1:33 Thursday. They will have been away 29 hours, spent 6 hours traveling, and produced for 8 hours.

The Scranton and Allentown groups have decided to drive; two members of each group possess full-size five-passenger cars and have volunteered them for the trip. The Scranton group will meet at the Scranton state office building at 9 a.m. for the three-hour drive; the Allentown participants will leave their office at 10 a.m. The Scrantonians will dine at Hu Nan, and those from Allentown, at Schindler's. They will leave

for the return trip immediately after the meeting. By 2 p.m., on reaching Scranton, the field office people will have been away 29 hours and will have spent 6 hours traveling. The drive to Allentown will be completed at 1 p.m.; that group will have been away 27 hours and will have spent 4 hours traveling. Both groups have, of course, spent 8 hours productively.

The Philadelphia office has selected Amtrak "Silver Liner" service as transportation. Members will leave the Philadelphia state office building at 9:30 to travel by SEPTA to Suburban Station for the 10 a.m. train. On arrival in Harrisburg at 11:47, they will proceed on foot to the Holiday Inn. Their evening meal will be taken at the hotel. The following day the 12:30 train from Harrisburg will place them in Suburban Station at 2:17 p.m. for the short SEPTA ride to their office. On arrival they will have spent 30 hours away, 5 hours traveling, and 8 hours productively.

Alternate Method (The Teleconference)

Having adopted the agenda, the meeting has been called for Wednesday at 8:30 a.m. Each field office group will use the facilities of the public television station in their city: the Altoona office will use the facilities of WPSX, State College; and Allentown will use the facilities of WLVT, Bethlehem. The headquarters unit will use the facilities of WITF, Hershey. The meeting will recess at 12:30 to allow two hours for individual field office discussions; lunch will be provided during this period. Adjournment will be at 4:30 p.m. Teleconference service will be suspended during the recess.

The headquarters conference site will be equipped with two cameras with operators (one for individuals and one for graphics),

appropriate graphics display devices, a coordinator to select between cameras, multiple microphones and an audio operator, a large screen picture display, loudspeaker, table, chairs, and the usual conference amenities.

Each participating site will be provided with picture and sound monitors for the entire duration of the conference. Since the opening three-hour presentation allows only for questions of fact, only audio origination, consisting of multiple microphones and an audio operator, will be furnished during that period. For the remainder of the conference, both audio and video origination service, consisting of one camera and operator, will be provided.

Conference technical control will be exercised by the PPTN Operations Center; two technicians will perform this function. After the first three-hour presentation period, when the picture will originate only from the headquarters group, the picture to be seen by all participants will be that of the person speaking, consistent with the desire of the Chair. Through the entire meeting audio will operate in a conversational mode: anyone may call for the floor, interrupt, or engage in discussion and be heard by all. The Governor's remarks will be recorded on a videotape to be played at the Center.

Conferees will travel to their sites by the most convenient means. Pittsburgh and Philadelphia personnel will use public transportation to travel from their offices to WQED and WHYY, respectively. Erie, Altoona, Scranton, and Allentown participants will use two shared personal automobiles each to travel to their assigned sites. Headquarters personnel will share a personal car to Hershey. Travel time for all participants except

Altoona will be approximately one-half hour in each direction. The Altoona delegation will require about one hour for the 42-mile trip to State College. At the conclusion of the conference, the participants will use the same means of transportation to return to their originations.

At the conclusion of the meeting, the participants will have produced eight hours of substantive activity. Altoona personnel will have expended two hours in travel while all others have consumed only one travel hour.

Cost Comparison

Cost Factor	Present Method (Physical Meeting)	Alternate Method (Teleconference)
Transportation	$ 2,548.70	$ 87.75
Time	4,810.00	975.00
Lodging	1,380.00	
Subsistence	1,430.00	275.00
Meeting Room	150.00	4,459.53
Interconnection		878.10
Governor's Presentation		80.50
TOTAL	$10,318.70	$6,755.88

Difference $3,562.82

Current Method Costs

Transportation

Based upon published fares or PennDOT mileage and Commonwealth allowance.

Pittsburgh (rail & PAT) ($59 + 1.40) x 10	$ 604.00	
Erie (air, cab & park) ($113.10 + 4) x 10 + ($15 x 2) x 2	1,231.00	
Altoona (rail) $31 x 10	310.00	
Scranton (car) (252 mi. x 22.5¢) x 2	113.40	
Allentown (car) (174 mi. x 22.5¢) x 2	78.30	
Philadelphia (rail & SEPTA) ($20 + 1.20) x 10	212.00	
TOTAL		$ 2,548.70

Lodging
Based upon Commonwealth travel allowance.

$23 x 60	TOTAL	$ 1,380.00

Subsistence
Based upon Commonwealth allowance of $18 for 24 hours plus $5 for each additional 6-hour period.

Pittsburgh (35 hrs.) $28 x 10	$ 280.00	
Erie (35 hrs.) $28 x 10	280.00	
Altoona (29 hrs.) $23 x 10	230.00	
Scranton (29 hrs.) $23 x 10	230.00	
Allentown (27 hrs.) $18 x 10	180.00	
Philadelphia (30 hrs.) $23 x 10	230.00	
TOTAL		$ 1,430.00

Travel Time
Based upon Average State Salary ($13 per hour)*

Pittsburgh - 11 hrs.	$1,430.00	
Erie - 5 hrs.	650.00	
Altoona - 6 hrs.	780.00	
Scranton - 6 hrs.	780.00	
Allentown - 4 hrs.	520.00	
Philadelphia - 5 hrs.	650.00	
TOTAL		$ 4,810.00

Meeting Room

$75 per day x 2	TOTAL	$ 150.00
	GRAND TOTAL	$10,318.70

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* Average State Salary

$$\frac{\text{(Salary + Benefit per year)}}{\text{(Workdays per year)}} \times \frac{1 \text{ day}}{7.5} = \text{Cost per hour}$$

$16,000 avg. salary + 35.5% benefit = $21,680

365 days less:
- 104 weekend
- 13 holiday
- 2 personal
- 15 annual
- 8 sick

$$\frac{\$21,680}{223} \times \frac{1}{7.5} = \$12.96+ = \$13$$

Alternate Method Costs

Teleconference Site	Audio Origination Per Hour	Audio/Video Orig/Hr			
Pittsburgh	$121.84	$159.57			
Erie	72.66	104.17			
State College	56.28	78.45			
Scranton	62.47	87.60			
Allentown	50.45	78.16			
Philadelphia	109.05	144.99			
Sub Total	$472.75	x 3 hr +	$652.94	x 3 hr	$3,377.07
Hershey			$180.41	x 6 hr	1,082.46
			TOTAL		$4,459.53

Network Facilities

Transmission ($15.05 per site x 7) x 6 hr	$593.10	
Control ($15 x 6 hr)	90.00	
Personnel ($13 x 2) x 6 hr	156.00	
TOTAL		$ 878.10

Transportation

Pittsburgh (PAT) $1.40 x 10	$ 14.00	
Erie (car) (10 mi x 22.5¢) x 2	4.50	
Altoona (car) (84 mi x 22.5¢) x 2	37.80	
Scranton (car) (16 mi x 22.5¢) x 2	7.20	
Allentown (car) (12 mi x 22.5¢) x 2	5.40	
Philadelphia (SEPTA) $1.30 x 10	13.00	
Harrisburg (car) (26 mi x 22.5¢) x 1	5.85	
TOTAL		$ 87.75

Travel Time

Pittsburgh, Erie, Scranton, Allentown, Philadelphia ($13 x 10 person x 1 hr) x 5	$650.00	
Altoona ($13 x 10 person x 2 hr) x 1	260.00	
Harrisburg ($13 x 5 person x 1 hr) x 1	65.00	
TOTAL		$ 975.00

Governor's Tape

Recording	$ 50.50	
Playback	18.00	
Stock	12.00	
	TOTAL	$ 80.50
Lunch - 55 x $5	TOTAL	$ 275.00
	GRAND TOTAL	$6,755.88

The Situation

The Governor's Task Force on Criminal Activity is in the process of preparing a new initiative on street crime in the inner city. To provide information and assistance to the development of the plan, Ms. Penn and Mr. Pitt, chiefs of the Urban Section field offices in Philadelphia and Pittsburgh, are to meet with Mr. Berg, the Task Force Coordinator. The participants agree that two hours is necessary to conduct the business of the meeting. Each participant will also need to spend two hours of the meeting day in his or her own office to fulfill regular business obligations.

Current Method (The Physical Meeting)

The participants agree to meet in Mr. Berg's office at 10 a.m. Tuesday. The meeting will last two hours, adjourn promptly at 12 noon, and will not break for lunch.

Because of the relatively short travel time, Ms. Penn elects to drive to Harrisburg. She leaves her home at 7 a.m. and proceeds via the Schuylkill Expressway and the Pennsylvania Turnpike. Exiting the turnpike at Harrisburg East, she travels I-83 and arrives in the city at 9:30 a.m.

Following a few minutes confusion with Harrisburg's one-way-street system, she parks her car in the Walnut Street Garage and arrives at Mr. Berg's office at 9:55.

Because of distance, Mr. Pitt elects to travel by air from Pittsburgh to Harrisburg. He leaves his Mt. Washington home at 5:45 a.m. using the Penn Lincoln Parkway. He drives to the airport and parks in the all-day lot. The free shuttle drops him at the terminal building at 6:30. Having already secured his ticket, he proceeds directly to the gate where he awaits the 7:08 a.m. departure of USAir flight 132. Flight 132 arrives precisely on time at Harrisburg International Airport, and since Mr. Pitt has brought only his carryon briefcase, eight o'clock finds him seated in the airport limousine awaiting those who are claiming their luggage. Fortunately, the wait is short, and after two intermediate stops, Mr. Pitts disembarks at the downtown Holiday Inn at 8:40. Following a leisurely belated breakfast, Mr. Pitt strolls to Strawberry Square and enters Mr. Berg's office at 9:45.

Mr. Berg is the more fortunate of the participants. Since the meeting is to be in his office, Mr. Berg has had only to clear his calendar for the period. He convenes the meeting promptly at 10 a.m.

As previously agreed upon, the meeting adjourns at 12 noon. Before leaving the building, Ms. Penn offers Mr. Pitt a ride to the airport. Mr. Pitt declines, noting that it will take her several miles out of her way and that he is not pressed for time. They part upon leaving the building--Mr. Pitt to the Holiday Inn for the limousine, Ms. Penn to the Walnut Street Garage.

Mr. Pitt reaches the Holiday Inn at 12:15 p.m. to find the limousine ready for departure. He boards and, again after two intermediate stops, arrives at the airport terminal at 12:50. He has time for lunch before boarding USAir 69 for an on-time departure at 2:36. Arriving in Pittsburgh as scheduled at 3:20, Mr. Pitt waits only a few minutes for the shuttle to the parking lot, then drives to his office at the Pittsburgh state office building. He parks in his usual space and reaches his office at 4:50. Mr. Pitt completes the work necessary and is free to go home at 7 p.m.

Ms. Penn leaves the Walnut Street Garage in her car at 12:20 p.m. Retracing her morning route, stopping for a sandwich at a Turnpike Plaza, she parks at her Center City home at 3:05. Using SEPTA, as she normally does each morning, Ms. Penn arrives at her Philadelphia state office building quarters at 3:30. Completing the necessary tasks, Ms. Penn locks her office at 5:30 and leaves the building.

Mr. Berg has followed his usual routine--remained in his office all day--and accomplished a fully productive day. Ms. Penn has put in a $10\frac{1}{2}$-hour day, traveled approximately 250 miles, and has produced 5 hours' work. Mr. Pitt has put in a $13\frac{1}{4}$-hour day, traveled about 425 miles, and produced 5 hours' work.

Current Method (Physical Meeting) Costs

Mr. Berg -- No Costs

Ms. Penn

Mileage (250 mi x 22.5¢)	$ 56.25	
Toll ($1.35 x 2)	2.70	
Parking	4.25	
SEPTA	.60	
Travel Time ($6\frac{1}{2}$ hr x $13)	84.50	
TOTAL		$148.30

Mr. Pitt

To Airport (7 mi x 22.5¢)	$ 1.58	
Airfare	132.00	
Limousine ($5 x 2)	10.00	
Parking (airport)	3.50	
To Office (20 mi x 22.5¢)	4.50	
Travel Time ($8\frac{1}{4}$ x $13)	107.25	
TOTAL		$258.83
GRAND TOTAL		$407.13

Future Method (Teleconference)

The meeting has been called for 10 a.m. At 9:40, Mr. Berg leaves his Strawberry Square office and walks to the teleconference center in the Education Building on Market Street; he stands for a few moments behind the desk putting his notes in order. A voice issues from a speaker greeting him and requesting that he be seated so that technical adjustments may be made. Mr. Berg is familiar with the procedure and knows that the voice is that of the technician at the Network Center. Mr. Berg settles behind the desk as the camera mounted in front of the desk makes small up and down, right-left movements, centering his image on the screen mounted below the camera. He chats with the technician as he sees his image come into sharp

focus on the screen; Mr. Berg knows that the small talk is for the purpose of audio adjustment. Two minutes after he has seated himself, Ms. Penn's picture appears on the screen, and the technician's voice, coming from the speaker next to the picture, says Ms. Penn will be connected shortly.

Ms. Penn has traveled from the Philadelphia state office building to the teleconference center at WHYY by SEPTA. She is as familiar with the adjustment procedure as Mr. Berg and is ready when the picture of Mr. Pitt appears and the technician announces, "Mr. Berg and Ms. Penn, you can have audio while I bring Mr. Pitt on line."

Mr. Pitt has used PAT to reach the WQED conference center from the Pittsburgh state office building. While Mr. Berg and Ms. Penn hold their conversation, Mr. Pitt talks with the technician. Soon Mr. Berg's picture appears on all screens, and the participants are told that arrangements are complete and they may proceed.

The meeting proceeds through the agreed two-hour term. Pictures on the display screen change to show the image of the person speaking. Frequent interruptions occur, and a very few heated discussions ensue as different views are brought to the matter at hand. Mr. Berg has prepared some graphs to illustrate his presentation. When he desires to use a graph, he places it in a marked area of the desk and presses a button to display it on the screen; another button restores his image.

The meeting concludes promptly at 12 noon. The participants take their leave and return to their offices. The participants have been away from their offices for four hours, of which less than one has been expended in travel and only six minutes was required for technical arrangements. Of the four hours, two have been devoted to the purpose of the meeting.

Future Method (Teleconference) Costs

Personnel Expense

Mr. Berg

Time (1 hr x $13)	TOTAL	$ 13.00

Ms. Penn

SEPTA (.60 x 2)	$ 1.20	
Time (1 hr x $13)	13.00	
	TOTAL	$ 14.20

Mr. Pitt

PAT (.70 x 2)	$ 1.40	
Time (1 hr x $13)	13.00	
	TOTAL	$ 14.40

Teleconference Room ($9.09 x 2 hr x 3)	$ 54.54

Network Expense

Circuits ($15.05 x 2 hr x 3)	$140.30
Control ($28 x 2 hr)	$ 56.00
GRAND TOTAL	$292.44

Estimated Teleconference Individual Site Costs

Equipment prices are based upon published price lists.

Hourly rates are based upon utilization at 520 hours per year.

Amortization is consistent with expectable life span.

Space	221 sq ft @ $7		$2.97
Furnishings	$ 825	5 yrs	.37
Camera	$10,000	7 yrs	2.75
Audio	$ 1,000	7 yrs	.27
Remote Control	$ 2,000	7 yrs	.55
Graphic Camera	$ 1,500	7 yrs	.41
Audio/Video Displays	$ 700	5 yrs	.27
Maintenance/Operation			1.50
		TOTAL	$9.09

APPENDIX H

Mission Statement

A TRANSITIONAL MISSION FOR PPTNC

The PPTNC Committee on Mission and Bylaws* proposes that the Commission adopt the following transitional mission statement, which will add to its existing legislative mandate and which would guide the Commission until PPTNC--or some other body--has been given this new legislative mandate.

This is the Mission Statement the Committee proposes:

PPTNC will seek to broaden its legislative mandate to include telecommunications, broadly defined, through appropriate action by the Governor and the General Assembly.

PPTNC, out of its mandate, history, and present commitment, proposes to serve as the principal instrumentality of the Commonwealth to monitor, plan, and advocate, in a continuing manner, the noncommercial uses of telecommunications innovations.

PPTNC will work with all executive and legislative agencies and departments to facilitate the more effective use of telecommunications in the implementation of their missions.

PPTNC will draw upon its operating history to provide human and technical resources and to act as a catalyst for such a planning effort.

PPTNC will work with the public television stations, public radio stations, and any other noncommercial telecommunications agencies

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*now the Long-Range Planning Committee

to develop a coherent and effective system of telecommunications in Pennsylvania.

PPTNC will draw upon its operating history to provide human and technical resources and to act as a catalyst for such a planning effort, working with the Governor and the General Assembly to conduct the necessary studies, analyses, and inquiries to bring this transitional mission into existence.

12/13/79

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TELECOMMUNICATIONS GLOSSARY

April 1981

A

A/B SWITCH - A mechanism for converting each channel on a standard television set into two channels, e.g., 2 A and 2 B.

AM - Amplitude modulation; one of several ways of modifying a radio wave to carry information; also, the radio band allocated to AM radio services. (See FM.)

ACCESS CHANNELS - Channels set aside by the cable operator (or specified by franchise) for use by the public, educational institutions, municipal government, designated institutions, or for lease on a non-discriminatory basis.

ACOUSTIC COUPLER - A device attached to a computer terminal to transmit and receive audio tones via telephone lines. A type of modem.

AERIAL PLANT - Cable that is suspended in the air on poles. The pole space is often leased from the telephone or power company.

ALPHANUMERIC INFORMATION - A combination of letters and numbers displayed on the TV screen.

ALPHANUMERIC KEYBOARD - A keyboard which allows communications with a computer in letters and numbers. Text displays consist of alphanumeric characters.

AMPLIFIER - A device that boosts the strength of an electronic signal. Amplifiers are spaced at regular intervals throughout a cable system to compensate for the weakening of the signal as it travels.

ANALOG - A form of information which is represented by continuous wave forms that vary as the source varies. (See digital.)

ANTENNA - The device connected to a television set so that it can receive off-the-air signals, or is used to transmit or receive broadcast signals.

AREA INTERCONNECTION - Large metropolitan areas require multiple headends, and interconnecting these headends allows simultaneous program distribution throughout the entire area. Selective program distribution to geographically separated neighborhoods with similar interests/needs is also possible through area interconnection.

AUDIO - The sound portion of a television or radio broadcast.

B

BANDWIDTH - The difference, in hertz (cycles per second), between the highest and lowest frequencies needed for adequate transmission of a given signal.

BASIC SERVICE (CABLE) - A program service which is offered to all subscribers of a cable system at no additional charge. (See also premium service.)

BCN (BROADBAND COMMUNICATIONS NETWORK) - Another term for cable television which highlights its potential future development. The difference between BCN and the majority of present cable systems is that BCN implies a two-way transmission capacity with computer-programmed signal distribution, so that any two community members/institutions can send video or digital signals to each other.

BETA - A ½" videocassette format introduced by the Sony Corporation.

BICYCLING - Program distribution by delivery of tape or film to individual stations or cable systems.

BIRD - A popular term for satellite.

BROADBAND - 1. A general term used to describe wide bandwidth equipment or systems which can carry a large portion of electromagnetic spectrum. A modern broadband communications system can accommodate all broadcast and many other services, with its 400 MHz capacity. 2. A range of frequencies wider than that required for just voice communications. Broadband channels are used predominantly for delivery of video material and for high-speed data transmission. (See narrowband.)

BROADCASTING - Transmission of information in one direction to a number of receivers, normally using the airwaves by electromagnetic propagation. (See also nonbroadcast distribution.)

BROADCAST TELEVISION - Television programming sent through the atmosphere.

C

CARS (Cable Television Relay Service) - A microwave frequency band used to relay television, FM radio, cablecasting and other signals to a terminal for distribution over cable. CARS systems operate under three year renewable licenses received from the FCC.

CATV (Community Antenna Television) - Another term for cable television.

CABLECASTING - Local organization or access programming that is carried over a CATV system. Distinguished from broadcast programming carried over the system.

CABLE DROP - The point where a cable television system is attached to an individual receiver or reception/distribution system.

CABLE TELEVISION - A multi-channel reception and distribution system for audio and video signals. Reception is by a master antenna, satellite ground-link, or leased circuits, all of which can provide both local and distant signals to subscribers. Distribution is by coaxial cable linking a central facility and subscribers. Newer systems can provide interactive capabilities. Cable systems are typically commercial enterprises franchised to serve a community.

CARRIAGE - A cable system's procedure for transmitting the signals of television on its various channels. FCC rules determine which signals cable systems must or may carry. Carriage also refers to a cable system's procedure for transmitting the signals of television stations on its various channels.

CERTIFICATE OF COMPLIANCE - The approval of the FCC that used to be required before a cable system could carry television broadcast signals. Regulation was deleted in October, 1978.

CHANNEL - In television, a single path or section of the electromagnetic spectrum 6 MHz wide, which carries a television signal, used for the transmission of associated video and audio signals.

CHANNEL CAPACITY - The maximum number of channels that a cable system can carry simultaneously.

CG (Character Generator) - A device which electronically displays letters and numerals on the TV screen.

CHIP - The heart of a microcomputer, a piece of silicon smaller than one's fingernail on which thousands of electronic elements are implanted. Called a microprocessor, it contains all the circuits one needs to carry out the many computer operations.

CLOSED CIRCUIT - A system of transmitting TV signals to private subscribers, in which the receiving and originating equipment are directly linked by cable, microwave or telephone lines, without broadcasting over the air.

COAXIAL CABLE - Coaxial cable is currently used in broadcast television and telephone systems, as well as cable television, for conducting a large volume of electronic signals. The cable itself is a copper or copper-sheathed aluminum wire surrounded by an insulating layer of polyethylene foam. The wire and the shielding react with each other to set up an electromagnetic field between them.

COMMON CARRIER - An entity that provides communication services to the public, at set rates, on a non-discriminatory basis, and exercises no control over the message content. Common carriers are regulated by state and/or federal agencies.

COMMUNICATIONS SATELLITE - A satellite in orbit around the earth that is designed to receive and relay television and other broadcast signals to and from earth.

COMPATIBILITY - The ability of various formats to be used together or interchangeably.

COMPUTER - A device that receives and then follows instructions to manipulate information. The set of instructions and the information on which the instructions operate are usually varied from one moment to another. If the instructions cannot be changed, the device is not a computer. The difference between a computer and a programmable calculator is that the computer can manipulate text and numbers; the calculator can manipulate only numbers.

CAI (Computer-Assisted Instruction) - Educational computer programs geared to individually paced learning. For example, the computer may instruct the pupil on American geography, ask which is the largest U.S. river, congratulate the student or correct the answer and repeat the question. CAI can be carried over two-way cable.

COMPUTER LANGUAGE - A language used to communicate with a computer. All computer language instructions must be translated by a program in the computer into the machine's internal language in order for the instruction to be implemented.

COMSAT - Communications Satellite Corporation, created by the Communications Satellite Act of 1962 to establish an international commercial satellite system, Intelsat.

COMSTAR - Satellite system owned by COMSAT and leased to AT&T and GTE.

CONVENIENCE REPLAY RIGHTS - Specific permission granted to users by the copyright holder to videotape and store a specified program for instructional use. Such permission is usually granted for at least one week but may be for as long as eight years.

CONVERTER - A device, sometimes a box or digital selector, used to convert television signals of one frequency to another. Cable systems install converters on TV sets in homes where more than 12 channels are carried on a single cable. This converter also protects signals from the interference of strong local signals by converting the cable channels to a channel where no local broadcast signals exist.

COOPERATIVE OWNERSHIP - A situation where the service, such as cable, is owned and operated by the users of the service, and where system policies are set by subscribers on a one subscription/one vote basis. There are 76 cooperatively owned cable systems in the U.S., and 11 in Canada.

COPYRIGHT - The exclusive right of ownership, distribution or presentation of a literary, theatrical, musical, or artistic work.

CPB - The Corporation for Public Broadcasting.

CROSSOWNERSHIP - Ownership of two or more kinds of communications outlets by the same individual or business. The FCC prohibits television stations and telephone companies from owning cable systems in their service areas. Television networks are prohibited from owning cable systems anywhere in the U.S.

D

DATA - The information given to or received from a computer.

DEDICATED LINES - Telephone lines which are leased for a specified term, between specific points, usually offering broader-band service than regular phone service.

DIAL ACCESS - A method by which telephone users can use that network to directly dial another telephone, a computer, or other device, as opposed to requiring an operator's or other manual assistance.

DIGITAL - A form of information which is represented by signals at discrete intervals. (See analog.)

DBS (Direct Broadcast Satellite) - A proposed system in which signals would be transmitted directly to a receiving dish on a subscriber's home, via satellite, rather than over cable or an intermediary terrestrial broadcasting station.

DISH - A parabolic antenna.

DISTANT SIGNALS - Signals originating beyond the range of ordinary over-the-air reception equipment. The FCC had previously limited cable operators in importing distant signals and carrying them on their systems. The Commission's proposed elimination of these restrictions is now in litigation.

DOMSAT - A domestic communications satellite; that is, a satellite used for communication within the U.S.

DOWNLINK - A receiving antenna designed to pick up signals from a communications satellite. Also known as ROT. (See uplink.)

DOWNSTREAM - Direction of cable signal <u>from</u> the headend to subscribers.

DROP CABLE - A coaxial cable that joins the subscriber's home or building to the system's feeder line.

DUAL CABLE SYSTEM - A CATV system that uses two coaxial cables to carry programming to subscribers. Dual cable doubles the channel capacity of the system through a switch that connects the subscriber's television set to either one or the other of the cables.

E

EARTH STATIONS - Electronic facilities that use antennas and associated electronic equipment to transmit, receive and process communications via satellite. Some earth stations can only receive signals. Future cable systems may be able to interconnect by earth stations (interconnection is already possible by cable links) to domestic communications satellites and thus create regional and national cable networks.

EDUCATIONAL CHANNEL - A channel or channels set aside for educational uses. Sometimes the uses are local school programs outside of course work. Some cable systems offer equipment to local schools for their use to cablecast school classes. This can be offered on the elementary, high school and college levels.

EDUCATIONAL PROGRAMMING - Programs prepared by, in behalf of, or in cooperation with an educational institution, library, etc. Such programming may be carried on an "educational channel" set aside by the cable regulator or the operator for that purpose.

ETV (Educational Television) - The original designation of public television. It often refers to, but is not limited to, public stations' ITV (instructional TV) services.

ELECTRONIC MAIL - The delivery of correspondence, sometimes including graphics, by electronic means, usually involving the interconnection of word processing, facsimile, and computer equipment. Reception can be by electronic video display of text or by printout. (See facsimile, word processing.)

EXCLUSIVITY - The contractual right to be the sole exhibitor of a program in a particular area during a particular time. The FCC has proposed an end to the protection of syndicated programs, which would allow cable operators to show them whether or not a local television station broadcast the same syndicated program. This proposed rule change is in litigation.

F

FACSIMILE - Transmission of images of original documents (including both print and graphics) by electronic means--usually via the telephone network. (See electronic mail, word processing.)

FCC (Federal Communications Commission) - A governmental agency established in 1934 with broad regulatory power over electronic media, including radio, television and CATV.

FEEDER LINE (or BRANCH) - An intermediate cable distribution line that connects house drops to the main trunk line.

FEED-FOR-RECORD - Transmission of a program before the scheduled airtime, so that stations may record it for later broadcast.

FIBER OPTICS - The very latest in cable technology and in other communication uses. A long and very thin glass fiber which has the ability of transmitting light signals with very little distortion and attenuation. Light signals can be modulated to carry many forms of information such as data or television signals. The potential capacity for information carried by fiber optics is large. Channel capacity alone could be as high as 1,000 or more TV channels in a single glass fiber strand. Structurally, the fiber consists of two types of glass (each with slightly different optical properties), with one type surrounding the other.

FILM CHAIN - A device for showing sound, motion pictures and slides on television.

FILTER - A circuit which allows signals of desired channels to pass through but blocks others. Used in trunk and feeder lines for special cable services, such as two-way operation.

FM - Frequency modulation; one of several ways of modifying a radio wave to carry information; also, a radio band allocated to FM radio services. (See AM.)

FOOTPRINT - The area of the Earth's surface over which signals from a given satellite may be received. Footprints are different for each satellite, but all domsats are receivable throughout the continental U.S.

FORMAT - A specific and unique system for recording and playing back specified television signals. (See Compatibility.)

400 MHz TECHNOLOGY - A set of technical advances, in the performance of amplifiers that allows an expansion of the usable frequency range from 300 to 400/440. Combined with HRC (Harmonical Related Carrier) systems, operators can now offer 50-54 cable channels.

FRAMEGRABBER - A device attached to a subscriber's television set that allows the viewer to capture a single frame of desired cablecast information (like a train schedule) and play it repeatedly so it can be examined.

FRANCHISE - The contractual agreement between a local governmental unit having authority and the cable operator. It authorizes the construction and operation of a cable system in a given community. The real reason for the need to franchise is that permission must be granted for cable companies to cross rights-of-way, bridges and other public lands to make the system operational.

FRANCHISING AUTHORITY - The governmental body responsible for specifying the terms of a franchise, awarding it, and regulating its operation. While the Franchising Authority is usually a local city or county body, some areas are regulated exclusively on the state level.

FRANCHISE FEE - Franchise fees to local communities come out of the amount the subscriber pays to the cable company. A franchise fee is somewhat like a tax that cable companies pay to local governments for local needs (if 3 percent or less). Franchise fees can be as much as 5 percent. However, the 2 percent above the standard 3 percent fee must be used for cable-related purposes by the local government. The FCC is considering changing its policy of a 5 percent fee maximum but when such a ruling will occur is not known.

FREQUENCY - The number of periodic waves (such as radio or television) in a given amount of time, expressed in Hertz (or cycles per second). Different frequencies define the channels of radio or television signals.

G

GEOSYNCHRONOUS ORBIT - An orbit 22,300 miles above the equator, in which a satellite appears to remain stationary in the sky because it is moving at precisely the speed of the Earth's rotation.

GigaHertz (GHz) - A unit of frequency. One GHz equals one billion cycles per second.

GOVERNMENT ACCESS CHANNEL - Government channels might be reserved for local government use to cablecast weekly council meetings or committee hearings and such. They might also be designated for state government use again to cablecast daily sessions or committee meetings plus any programming from other state departments of interest to the general public. Finally, C-Span is the U.S. government channel offered by some cable companies. This broadcasts live the daily sessions of Congress.

GRADE A CONTOUR - The line encompassing a television station service area in which a good picture is estimated to be available 90 percent of the time at 70 percent of the receiver locations.

GRADE B CONTOUR - The line encompassing a television station service area in which a good picture is estimated to be available 90 percent of the time at 50 percent of the receiver locations. The Grade B Contour is larger than and surrounds the Grade A Contour.

GRANDFATHERING - Exempting cable systems from regulatory or legislative enactments because 1) they were in existence or operation before the rules, or 2) substantial investments were made in system construction before the rules. FCC grandfathering applies, for example, to signal carriage and certain cross-ownership situations.

GROSS SUBSCRIBER REVENUES - The figure that results from multiplying the total number of subscribers with the total monthly fees they pay.

GROUNDLINK - An earth station for communication with a satellite.

H

HARDWARE - 1. The electronic equipment (computers, terminals, telephones, switchboards, etc.) of telecommunications and/or data processing systems. (See software.) 2. Mechanical, magnetic, electrical, and electronic devices which make up a computer. The physical equipment that goes into a computer system, consisting of the central processing unit plus all peripherals. 3. The equipment used in production, storage, distribution or reception of electronic signals. It may also apply to access equipment. In cable it means the headend, the coaxial cable network, amplifiers, the TV receiver and more.

HEADEND - Electronic control center--generally located at the antenna site of a cable system--usually including antennas, amplifiers, frequency converters, demodulators, modulators and other related equipment which amplify, filter and convert incoming TV signals to cable system channels.

HOUSE DROP - The coaxial cable installed in the feeder cable which connects each building or home TV set to the cable network. Also called a tap.

HUB - An interconnected headend in area interconnection of a CATV system.

I

ITV (Instructional Television) - As opposed to broadly educational or cultural television programming, ITV is dedicated to the support of formal classroom education.

ITFS (Instructional Television Fixed Service) - An instructional broadcasting system where signals are distributed on a special microwave band to one or more fixed receiving points.

INTELSAT - International Telecommunications Satellite, used for communication between nations. Often used for live broadcasts of special events of world-wide interest.

INTERACTIVE - 1. System capable of two-way communication with a user during operation. A system is interactive if it responds to the user quickly--usually less than a second. All personal computer systems are interactive.
2. Descriptive of a telecommunications system whose response time to user input is nearly immediate.

INTERCONNECTION - Linking of CATV headends--by supertrunks, microwave relay or satellites--so that the same programming can be aired simultaneously on separate systems; also used in other telecommunications applications.

INTERFACE - An electronic circuit used to connect one electrical device to another electrical or mechanical device to allow the flow of data between units. It refers to the matching or interconnecting of systems or devices having different functions.

INTERFERENCE - In a signal transmission path, extraneous energy which tends to interfere with the reception of the desired signals.

INTERNAL STORAGE - Memory system which is a part of the computer, as opposed to external tape or disk storage.

INTERPRETER - A computer program used to translate languages at the time of processing.

IN-WATS (Wide Area Telephone Service) - A telephone service permitting users to make long-distance toll-free calls to a cental location, often an 800 area code number. Charges to the IN-WATS center are made on a monthly flat-rate basis within certain limits.

I/O - Input/Output of information in a computer system. Examples of I/O devices are: a keyboard, a floppy disk drive, and a printer.

K

KEYBOARD - A device for typing information into a computer. It is similar in design and function to a typewriter keyboard. The computer keyboard has several additional keys for specific computer functions.

KiloHertz (KHz) - A unit of frequency. One KHz equals one thousand cycles per second.

LANGUAGE - A format by which a programmer can communicate more efficiently with a computer where predetermined commands will yield requested actions. Basic is one of the most popular languages. A language is a defined group of representative characters or symbols, combined with specific rules necessary for their interpretation. The rules enable an assembler or compiler to translate the characters into forms (such as digits) meaningful to a machine, system or a process.

LEAPFROGGING - Cable operators' practice of skipping over one or more of the nearest TV stations to bring in a more distant signal on the cable.

LEASEBACK - The practice by telephone companies, cable equipment manufacturers, and others, of installing and maintaining cable distribution systems, and "leasing" the facilities "back" to separate contractors for operation of the system.

LEASED CHANNELS - Channels that might be available for lease from the cable company. They can be leased by groups or individuals for the sole use of the lessee at posted rates. These may be in addition or in place of designated channels such as public, education and government access channels.

LINE FEED - A coaxial cable connecting a shooting location to a videotape recording facility some distance away.

LINE-OF-SIGHT - Descriptive of distribution systems on the surface of the earth which must take into account the earth's curvature or physical obstacles that would obstruct the signal.

LIVE - When what the viewer sees is actually taking place on television at the very same moment; a production which is telecast simultaneously with its performance, versus videotaped or filmed production which is prepared prior to telecast.

LDS (Local Distribution Service) - Process in which signals are transmitted by microwave from the headend to distribution centers within the CATV system's franchise area. At these centers, the signals are converted back to VHF frequencies and fed to subscriber homes over coaxial cables, thus sidestepping some construction problems involved in laying cable in some areas.

LOCAL LOOP - The connection via land lines used to send a live broadcast from its point of origination to the longline facility.

LOCAL ORIGINATION - Programming that is produced and cablecast by the CATV system operator.

LOCAL ORIGINATION CHANNEL (LOs) - A channel or channels on a cable system which is programmed by the cable system and subject to its exclusive control. The bulk of local originations are automatic. The most popular offerings are time and weather, followed by news tickers, music, and stock market tickers.

LONGLINE - A group of different technologies, including microwave, cable, and satellite, which are combined to distribute information over great distances.

"LOOK AT" - When a downlink antenna is aimed at a particular satellite, it is said to be "looking at" that satellite.

LOW-NOISE-AMPLIFIER (LNA) - Amplifier used to boost the received signal at the antenna, to reduce interference in the feed line from the antenna to the receiver.

LOW POWER TELEVISION STATION - A television broadcast station which is licensed to operate under Part 74 of the Rules and Regulations of the Federal Communications Commission (FCC) as a TV translator with waiver(s) to permit local origination; or is licensed to operate under such amendments, addenda or additions to those rules and regulations as may result from procedures under FCC Docket 78-253.
In general: a television broadcast station having an effective radiated power of no more than 10 watts at VHF or 1,000 watts at UHF, and designed to service a local, defined geographical area. Such television stations may originate local programming as a full- or part-time activity; may, with appropriate permissions, retransmit the signals of another television broadcast station as a primary or supplementary activity; may transmit or retransmit television programming received by means other than off-air broadcast reception; may operate as a commercial or non-commercial entity and may charge a subscription fee for reception of its programming either in whole or in part.

M

MAIN MEMORY - That memory which is directly accessible to the computer. It contains the operating system, programs, and data being processed. In a microcomputer, main memory is referred to as RAM or ROM.

MASS STORAGE - Devices such as disks or tapes are used to store large quantities of data. These devices are not directly accessible for processing by the computer; therefore, the data which are stored must be read into main memory before the computer can use it.

MATV (Master Antenna Television System) - A system that serves a concentration of television sets such as an apartment building, hotel, etc., utilizing one central antenna to pick up broadcast signals.

MASTER TV CONTROL - The point at which all TV signals appear subsequent to controlled distribution to a transmitter or cable transmission system.

MegaHertz (MHz) - A unit of frequency. One MHz equals one million cycles per second.

MEMORY - A computer's capability of storing information; the computer component in which information is stored.

MEMORY CHIP - A chip which stores data in the form of electrical charges.

MICROCOMPUTER - A hardware configuration usually acquired in one of three ways: (1) by constructing several components from individual electronic parts (as in building a stereo system from a kit); (2) by connecting several already-constructed components (as in purchasing a separate amplifier, speaker, and turntable); or (3) by purchasing a unit with built-in components (as in buying a complete stereo system in one package, plugging it in, and using immediately). The end product of the microcomputer is information. It records this information, processes it, puts it into meaningful terms, communicates it, stores it, and retrieves it when needed. It usually includes the microprocessing unit, a keyboard for entering data, and a cassette tape recorder or a disk for storing programs, and a TV-like screen for displaying results.

MICROPROCESSOR - A subminiature computing device which can both process and store information.

MICROSECOND - One millionth of a second.

MICROWAVE - 1. Line-of-sight, point-to-point transmission of signals at extremely high frequencies. 2. Any radio frequency between 1 and 300 GHz. While the frequencies used for satellite transmissions fall in this band, the term is usually used in reference to land-based point-to-point transmission over long distances, using a series of repeater stations. Microwave transmission is only possible along a line-of-sight. 3. A radio wave of less than 10 centimeters length which is used for the transmission of many types of information--e.g., voice, data, and video signals. Microwave transmission/reception systems can carry many signals at once. These systems operate on a terrestrial line-of-sight basis--that is, mountains or the curvature of the earth, for example, can obstruct signals. Thus, microwave systems are usually composed of signal-relaying stations at distances of 25-30 miles apart.

MINORITY OWNERSHIP - Any system owned and operated by members of a recognized ethnic, racial, religious or other minority group.

MODEM - A contraction of "modulator-demodulator." A device which can convert signals from one form to another--for example, to make business machine signals compatible with telephone lines.

MODULATION - The process of impressing audio or video impulses on the carrier wave for transmission through the air or through a cable using RF techniques.

MODULATOR - An electronic device that allows a normal television set to be used as the video display unit. Frequently referred to as an RF Modulator.

MONITOR - A television set which is used to receive a televised production telecast for private screening purposes, versus a set which receives a telecast in the home.

MSO (Multi-System Operator) - A company that owns several different local cable systems.

MULTIPOINT DISTRIBUTION SERVICE (MDS) - Stations are intended to provide one-way microwave radio transmission (usually in an omnidirectional pattern) of customer supplied programming from a stationary transmitter to multiple receiving facilities located at fixed points designated by the customer.

MUNICIPAL OWNERSHIP - Ownership and operation of a system by a local government body, often the franchising authority.

N

NANO SECOND - One billionth of a second.

NARROWBAND - A range of frequencies not wide enough to include video signals; used primarily for voice signals. (See broadband.)

NARROWCASTING - A term for cablecasting that emphasizes cable's ability to provide specialized programming for interest groups in the community.

NETWORK - Television carried on a national basis by many stations, usually simultaneously within time zones; stations receive and telecast the programming from a central point by means of coaxial cable, micro relay, etc.

NETWORKING - Interconnection of CATV system's headends by microwave relay or satellite, on a national or regional basis.

NETWORK NON-DUPLICATION - The FCC rule that prohibits a cable system from showing a network program at other times if the local network affiliate so requests.

911 - (Pronounced "nine-one-one" and not "Nine-eleven.") A three-digit telephone number set aside for use by the public to gain access to emergency services in those communities that have established such a system.

NOISE - 1. Banding in which the visible difference is in noise level.
2. Refers to inaccurate data transmission. This causes typographical errors in output.

NON-BROADCAST TELEVISION - Television programming distributed by any method other than open air broadcasting.

NPR - National Public Radio.

NTIA - The National Telecommunications and Information Administration of the United States Department of Commerce.

O

OFF-AIR - Reception of a TV signal that has been broadcast through the air.

OFF-LINE - Refers to data which are stored on devices not immediately accessible to the computer. Data stored on magnetic tape, punched cards, or paper tape must be loaded into on-line storage to be available to the computer.

ON-LINE - Connection to a central computer, often remotely and involving the nearly instantaneous entering of information to a processor. (See teleprocessing.)

OPEN-AIR - See Broadcast Television.

OPTICAL FIBER - Threads of glass that have been manufactured to transmit signals of light generated by lasers or light-emitting diodes. Optical fiber transmission systems offer a very large signal-carrying capacity.

ORDINANCE - In cable, the enabling legislation passed by a local government to establish guidelines for the franchising process within a legally defined area.

P

PACKET-SWITCHING - A technique, usually digital, in which input information--voice or data-- is broken into short "packets" allowing high-capacity, high-speed transmission which may then be delivered to selected users.

PARABOLIC - The shape used for downlink and uplink antennas. It has the characteristic of focusing all waves received from the direction at which it is aimed precisely to a single point.

PAY-CABLE - Pay-TV delivered over cable, where subscribers pay an additional fee for services such as first-run movies or sports events.

PAY TV - A system of television in which viewers pay directly for programs not available on advertiser-supported TV. Scrambled signals are usually distributed and unscrambled at the homeowner's set with a decoder. Subscribers pay for programs either by channel, in which monthly payment covers all programming on a nearly continuous operating channel; or per program, in which the decoder is activated upon payment for a specific program (much like what many hotels offer in their rooms). Current examples of pay fare include sports programs, first-run movies (without commercials), cultural events or professional training. Pay TV on cable systems is also known as pay cable, subscription television and premium TV.

PENETRATION - The ratio of the number of cable subscribers (or pay-tv subscribers) to the total number of households passed by the system.

PERFORMANCE STANDARDS - The minimum technical criteria that must be met by cable systems, consistent with standards set by the FCC or the local ordinance.

PERSONAL COMPUTER - A microcomputer designed for use by an individual for entertainment, instruction, and bookkeeping chores.

PICTURE MONITOR - This refers to a cathode-ray tube and its associated circuits, arranged to view a television picture.

PICTURE SIGNAL - That portion of the composite video signal which lies above the blanking level and contains the picture information.

POLE ATTACHMENT - When cable systems use existing pole lines maintained by power and telephone companies, an attachment contract must be negotiated between the parties of interest.

PORTAPAK - Portable videotape recorder weighing about 20 pounds and using 1/2" or 3/4" videotape.

PREMIUM SERVICE (CABLE) - A program service available as an option for cable television subscribers. Those who elect to have the service pay an extra monthly fee for it. The signal is scrambled so that only those who pay the fee can receive it.

PRINTER - A peripheral device which accepts output data from a processor and prints characters on paper. Printers are defined as impact or non-impact depending on the means by which a character is formed on the paper. Impact printers strike the paper through a ribbon in a manner similar to a typewriter. Non-impact printers form characters by various means such as heat, electrical charges, or spraying ink.

PROGRAM - A series of instructions to a computer which cause the computer to solve a problem or perform a task.

PUBLIC ACCESS - Access by the general public to speak or present program materials on cable television channel normally dedicated for this purpose.

PUBLIC ACCESS CHANNEL - A channel on a cable television system made available for local citizen use.

PBS (The Public Broadcasting Service) - The national public television network.

QUADRUPLEX - An adjective describing a standardized method of video magnetic tape recording which uses four magnetic heads mounted around the rim of a head wheel. The head wheel rotates in a plane perpendicular to the direction of the tape motion.

QUADRUPLEX RECORDER - A videotape recorder with a revolving head wheel assembly which contains four record and playback heads over which tape is transported. The equally spaced heads take turns recording. Two inch tape is used. Two additional heads record an audio track and a control track along the length of tape. This method of recording provides a higher degree of image resolution and color quality control than that obtained with single recording heads in helical scan equipment.

QUBE - A Warner-Amex interactive system first installed in Columbus, Ohio. Qube is often (but improperly) used to refer to two-way systems in general.

R

REMOTE DATA ENTRY - Use of a device permitting direct access to a computer in a different location. (See on-line, teleprocessing.)

REMOTE PICKUPS - Events televised away from the studio by a mobile unit or by permanently installed equipment at the remote location.

RENT-A-CITIZEN - A practice commonly used in the franchising process, whereby cable companies give (or sell at reduced rates) stock in their company to prominent community leaders who they feel could exert influence on the franchising authority, and aid the company's application.

REPEATER - A device used to restore signals which have been distorted or weakened to their original shape and transmission strength; also used to transmit these signals in one or more directions.

RESOLUTION (HORIZONTAL) - The amount of resolvable detail in the horizontal direction in a picture. It is usually expressed as the number of distinct vertical lines, alternately black and white, which can be seen in three-quarters of the width of the picture. This information usually is derived by observation of the vertical wedge of a test pattern. A picture which is sharp and clear and shows small details has a good, or high, resolution. If the picture is soft and blurred and small details are indistinct, it has poor, or low, resolution. Horizontal resolution depends upon the high-frequency amplitude and phase response of the pick-up equipment, the transmission medium and the picture monitor, as well as the size of the scanning spots.

RESOLUTION (VERTICAL) - The amount of resolvable detail in the vertical direction in a picture. It is usually expressed as the number of distinct horizontal lines, alternately black and white, which can be seen in a test pattern. Vertical resolution is primarily fixed by the number of horizontal scanning lines per frame. Beyond this, vertical resolution depends on the size and shape of the scanning spots of the pickup equipment and picture monitor and does not depend upon the high-frequency response or bandwidth of the transmission medium or picture monitor.

RETROFITTING - Modification of the original cable plant to improve quality and/or increase channel capacity.

RF CONVERTER - A device that converts electronic signals to a "radio frequency" capable of being received on a specific television channel.

RFP (Request for Proposals) - The document issued by the franchising authority for the applicant's use. It usually states proposed guidelines, outlines minimum requirements for each applicant, and specifies application deadlines.

R-F PATTERN - A term sometimes used to describe a fine herringbone pattern in a picture. May also cause a slight horizontal displacement of scanning lines resulting in a rough or ragged vertical edge of the picture. Caused by high frequency interference.

S

SATCOM - Satellites owned and operated by RCA-Americom.

SATELLITE - A device located in orbit above the earth which receives transmissions from separate points and re-transmits them over a wide area.

SCA (Subsidiary Communications Authorization) - Portions of a frequency allocated to a radio or television broadcast station which are not used for the main signal, but which, with appropriate equipment and licensing, can be used to distribute information in addition to the main signal. Those receiving the signal must also have special equipment. SCA's are not considered as broadcast systems. SCA's on radio broadcast stations may be leased for commercial background music in shopping areas, services to handicapped persons, training programs for special target groups, etc.

SCRAMBLECASTING - Transmission of programs which are scrambled and then decoded in the subscribers home. (See also STV.)

SECURITY SYSTEMS - General term encompassing smoke detectors, burglary devices, and other services aimed at protecting the health and welfare of subscribers and users.

"SEE" - The ability to receive from a particular satellite. (See also "look at.")

SHOP-AT-HOME - Any program allowing subscribers to view products and/or order them by cable, including catalogues, shopping shows, etc.

SHOPPING BASKET - A program providing comparative pricing of consumer goods at various outlets in the subscribers' area.

SIDEBAND - The range of frequencies on both sides of the main frequency content of a radio signal.

SIGNAL - Information transposed into electrical impulses. There are two basic signals involved in television transmission--the picture or video signal and the sound or audio signal, each signal contains electrical impulses representing elements transmitted.

SOFTWARE - Programming and programming materials such as films, videotapes and slides; or the instructions that determine the steps to be followed by computer system hardware. (See hardware.)

STV (Subscription Television) - Pay-TV programs delivered by MDS or over-the-air. Signals are scrambled and decoded in the subscriber's set by a special receiver.

SUBCARRIER - A carrier which is in turn carried by another carrier. The color information in a television signal, for example, is modulated onto a subcarrier in the video carrier.

SUBSCRIBER - 1. A household connected to a local cable system. Since households, rather than individuals, are connected to the system, the actual number of people receiving the cable service may be considerably greater than the number of subscribers. 2. A person who pays an installation charge and monthly fees to a cable system operator for providing a connection to the cable system, and for the programs and services carried over the cable.

SUPERSTATION - A regular broadcast TV or radio station whose signal is also carried by cable systems all over the country. The individual station has no control over this distribution, but may derive additional advertising revenue as a result of the increased audience.

SYNC - 1. Matching of sound to pictures. 2. Synchronization pulses, reference fed to cameras and videotape recorders to tell the TV set how and when to scan its picture tube to make an intelligible picture.

SYNC GENERATOR - A unit emitting synchronizing pulses to control TV picture scanning and brightness.

SYNCH - Synchronization pulses that keep the various circuits of television equipment working in phase with each other.

SYNCHRONIZATION - The maintenance of one operation in step with another.

T

TAP - A device installed in the feeder cable which connects the home TV set to the cable network. Also called a drop.

TELCO LINE - Video signal transported over telephone line.

TELECOMMUNICATIONS - 1. Any transmission, emission or reception of signs, signals, written images and sounds or intelligence of any nature by wire, radio, visual or other electro-magnetic systems including any intervening processing and storage. 2. Any origination, creation, transmission, emission, storage, retrieval, or reception of signs, signals, writing, images, and sounds, or intelligence of any nature, by wire, radio, television, optical, or other electromagnetic means; more generally, communications over distances.

TELECONFERENCE - The means whereby the interactions between people who are in different places are conveyed electrically (in audio, video, graphic, or textual form).

TELEMEDICINE - Medical care through a telecommunications medium. Doctors can perform such duties as physical examinations, X-ray evaluation, physiological test interpretation, diagnosis and medicinal prescription using two-way CATV.

TELEMETRY - Communication of information generated by measuring devices. A common application in health services is the transmission of electrocardiogram readings to a specialist in a medical center.

TELEPROCESSING - Data processing where the actual data manipulation is performed at a processor that is electrically connected but physically remote from where the data is entered or used. (See on-line, remote data entry.)

TELETEXT - A one-way information service which is inserted in the vertical blanking intervals of the video signal. Broadcast or cablecast.

TELETYPE - A trademark of the Teletype Corporation. Used generically to refer to a system with keyboard printing devices connected to a computer or communication system. Also refers to the keyboard device.

TELEVISION HOUSEHOLD - A household having one or more television sets. Estimates for each county are based on an updating of American Research Bureau (ARB) TV penetration estimates. The number of households that watch television in any locality during prime-time hours determines the top 100 markets for FCC cable rules.

TELEVISION MARKET - A city or complex of neighboring cities served by commercial television broadcast signals from one or more TV stations located within the area. The FCC has used television markets for designating what kind of cable services an operator should provide in terms of signal carriage and nonbroadcast channel use (e.g., Detroit is the seventh largest market).

TELPAK - The Bell System's term for the leasing of long-distance channels or circuits in groups of 12, 24, 60, or 240, at costs less than the leasing of the same number of channels or circuits individually.

TERMINAL - A device which can send or receive information over a communications channel. A computer terminal can enter data to a processor and can receive information on how the computer is processing the information. Other examples of terminal devices are telephones or teletypes.

TEXT TRANSMISSION - Reception and distribution of printed text materials which may be displayed in a video screen format.

TIERING - Multiple levels of CATV service. Each level (or "tier") has a greater number of channels than the preceding level.

TOP-100 MARKET (Or Major Market) - 1. The 100 largest television markets, based on population estimates. 2. Ranking of largest television broadcast areas by size of market; i.e., number of viewers and TV households. Used in FCC rulemakings and in selling of air time to advertisers.

TRANSLATOR - 1. A relay system that picks up distant television signals, converts the signals to another channel to avoid interference, and re-transmits them into areas the original station could not reach. 2. A repeater that amplifies and reshapes the form of a broadband signal.

TRANSPONDER - A combination receiver-transmitter on a satellite, which picks up a signal on one frequency and retransmits it on a different frequency. Current communications satellites have either 12 or 24 transponders.

TRUNK CABLE - The main coaxial cable in the system, from which the feeder lines branch out.

TUNER - The electronic device that adjusts a television set to receive a specific channel.

TUNER/TIMER - A device connected to a videotape recorder that allows unattended recording of specific television programs from a specific channel of a television set at a pre-determined time.

TVRO (Television Receive-Only terminal) - Another term for a downlink.

TWO-WAY CAPACITY - Ability of a cable system to conduct signals to the headend as well as away from it. Two-way bidirectional systems carry data and audio and video television signals in either direction (also called interactive).

TWO-WAY RADIO - 1. Land mobile radio services providing two-way (usually voice) communications between and among mobile vehicles, base stations, and portable hand-held units, with associated repeaters. 2. Paging systems, which use the same frequencies as the above systems, but which are actually one-way voice and "beeper" systems.

U

UHF (Ultra High Frequencies) - The range of frequencies from 300 to 3,000 Megahertz. TV channels 14 through 83 are in the UHF band.

U-MATIC - A 3/4" videocassette format introduced by the Sony Corporation.

UNDERGROUND INSTALLATION - A method of installing cable underground as opposed to aerial suspension on poles.

UPLINK - 1. An antenna that transmits signals up to a communications satellite. 2. Transmission path from an earth station (groundlink) to a communications satellite. (See downlink.)

UPSTREAM - Direction of cable signal from the subscribers to the headend.

V

VCR (Videocassette Recorder) - A machine used to record and playback images on magnetic tape, packaged in a cassette for easier storage, convenience and longevity.

VHF (Very-High Frequencies) - The frequency band from 30-300 MHZ; includes TV channels 2-13.

VHS - A ½" videocassette format introduced by the Japan Victor Company.

VIDEO - The visual portion of a television broadcast. (a) To dub by re-recording the video signal recovered from the tape being copied; (b) A copy made by this process.

VIDEO BAND - The frequency band utilized to transmit a composite video signal.

VIDEOCASSETTE - A plastic container that contains a length of videotape for ease in loading and storage.

VIDEO CASSETTE SYSTEM - A system of recording and playback of video images onto an enclosed reel of videotape. Video cassettes, cassette players and cassette recorders are commonly described in terms of the width of the magnetic tape, e.g., 1/2-inch, 3/4-inch, etc. They record both black and white and color images, permitting both recording and playback (via video cassette recorders), or only playback (via video cassette players), using a typical home television receiver.

VIDEO DISCS - A system of recording video images on a phonograph-like disc. Video disc systems are currently being marketed for playback only. There are two different (and incompatible) systems--one using laser (light sensitive) technology, and the other using a capacitator (needle).

VIDEO DISPLAY UNIT (VDU) - A component of a microcomputer system which displays the output on a screen similar to a TV screen. A television monitor is a type of video display unit.

VIDEOTAPE - A magnetic tape capable of recording a television signal that is used to electronically record sight and sound for instant playback. Videotape comes in 1/4", 1/2", 3/4", 1" and 2" widths and can be erased and reused.

VIDEOTEX (Also spelled Videotext) - A low-cost, easy-to-use information service which normally uses the telephone lines and a modified TV set to allow user to access information from a centralized data base.

VIEWDATA - See videotex.

VTR (Videotape Recorder) - A device that can record visual and audio information on magnetic tape for storage and later playback.

W

WESTAR - Satellites owned and operated by Western Union.

WORD PROCESSING - The application of computer technology to automate office functions. Among the capabilities of a word processing system are electronic storage and retrieval of documents; electronic text correction and editing; and, by being linked to a telecommunications distribution system, electronic mail and text transmission. (See facsimile, electronic mail.)

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